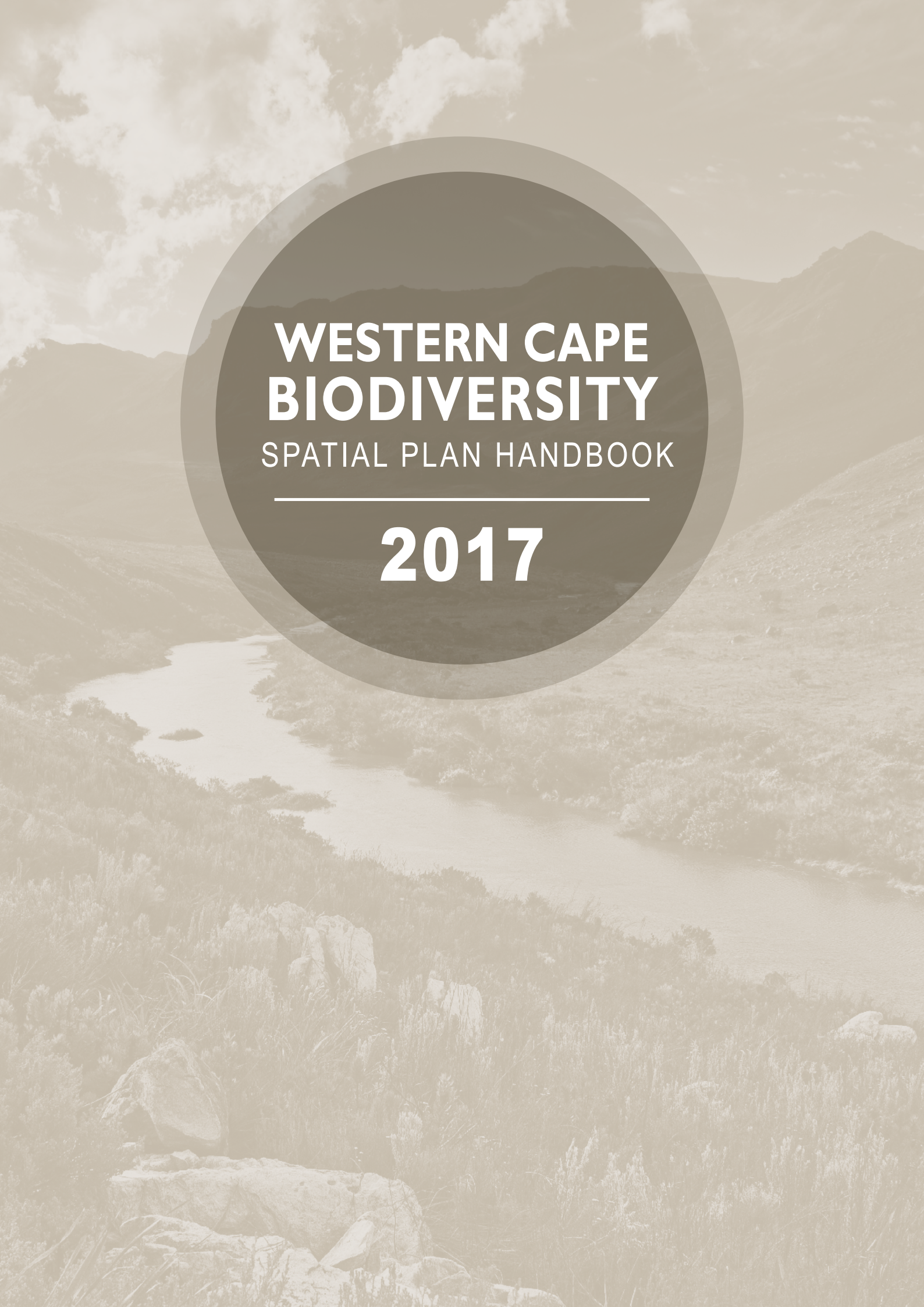
WESTERN CAPE BIODIVERSITY

SPATIAL PLAN HANDBOOK

2017



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CapeNature

Western Cape Government
Environmental Affairs and Development Planning
BETTER TOGETHER.


Ruida Pool-Stanvliet

Preface

The Western Cape is endowed with world-renowned biodiversity and natural resources. Together with this unparalleled endowment comes international responsibilities as well as significant opportunities for our people and the biodiversity economy. The Western Cape Biodiversity Spatial Plan (WCBSP) represents the "state of the art" provincial systematic biodiversity planning product. It represents the priority biodiversity areas and ecological infrastructure that need to be secured in the long-term in order that we, together with CapeNature, fulfil our core provincial mandate for biodiversity management.

Ecosystem goods and services are the foundation of our economy in the Western Cape necessary for inclusive economic growth and the sustainable delivery of basic services. Proactively identifying the priority biodiversity areas and ecological infrastructure in the Province and thus informing proactive protection as well as forward planning and decision-making is fundamental to attaining Goal 4 of the Western Cape Government's Provincial Strategic Plan (2014–2019): to *enable a resilient, sustainable, quality and inclusive living environment.*

The development and implementation of the WCBSP is a core output for the Provincial Biodiversity Strategy and Action Plan (2016) which is aligned to the Aichi Targets for the United Nations Convention on Biological Diversity as well as the National Biodiversity Strategy and Action Plan (2015). This *Western Cape Biodiversity Spatial Plan Handbook* thus provides all stakeholders with the strategic and practical guidance on how to ensure that planning and decision-making build resilience of our ecological infrastructure. Critically, the WCBSP must be used to inform how we invest in ecological infrastructure to ensure that our natural resources are managed to improve resilience and water security into the future. This will be crucial in enabling "future proof" development as part of our response to climate change, including adaptation and disaster risk reduction.

The WCBSP replaces all previously published biodiversity informants to strategic forward planning and will be used in the revision of the Provincial Spatial Development Framework as well as all Municipal Spatial Development Frameworks. It provides strategic guidance to programmes for strategic investment and associated land assembly and consolidation. Further, the WCBSP presents the best available science that must be taken into account in all land use and environmental decision-making. Detailed guidance is presented in this Handbook to ensure that such decision-making contributes to the long-term ecosystem resilience in the Province.

The implementation of the WCBSP and the Handbook will be supported by the Western Cape Department of Environmental Affairs and Development Planning and CapeNature through ongoing technical support and capacity building in priority sectors. Further, my Department will seek approaches to ensure that the policy and legal frameworks are strengthened to support the effective attainment of our targets.

Partnership with the South African National Biodiversity Institute amongst other have enabled the development of the WCBSP. Partnership with key sectors is indeed at the heart of success in securing our biodiversity and ecological infrastructure into the future. We encourage all sectors to join us in ensuring our collective action brings about the attainment of the vision of the WCBSP: *biodiversity and ecological infrastructure are highly valued as assets, integrated into all planning spheres, and managed in a sustainable way so as to ensure the persistence of healthy, functioning and representative ecosystems and associated services which benefit all.*

ANTON BREDELL

Minister of Local Government, Environmental Affairs and Development Planning

Executive Summary

The Western Cape is the country's leading exporter of agricultural commodities, is a province of outstanding natural beauty and a preferred destination for tourists and permanent residents alike. Towards ensuring the wise management of biodiversity priority areas and sustainable development within a growing economy, the Western Cape Nature Conservation Board (CapeNature) has developed a province-wide Western Cape Biodiversity Spatial Plan.

The Western Cape Biodiversity Spatial Plan (WCBSP) is a spatial tool that comprises the Biodiversity Spatial Plan Map (BSP Map) of biodiversity priority areas, accompanied by contextual information and land use guidelines that make the most recent and best quality biodiversity information available for land use and development planning, environmental assessment and regulation, and natural resource management. The BSP Map covers both the terrestrial and freshwater realms, as well as major coastal and estuarine habitats. This Handbook presents the BSP Map and explains its development, describes important biodiversity features of the Western Cape, and presents a set of land use guidelines that should be used to effectively aid in conserving the biodiversity of the Western Cape. The BSP Map is the product of a systematic biodiversity planning approach that delineates Critical Biodiversity Areas and Ecological Support Areas, which require safeguarding to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services.

The Western Cape Province covers a land area of 130 000 km^2 and is home to approximately 6.5 million people. The province is endowed with rich natural capital (i.e. biological diversity), and varied scenic and cultural resources which make the Western Cape the country's premier tourism destination. The province is home to the Cape Floristic Region, the smallest and most diverse of the six global Floral Kingdoms, and one of the 34 globally-recognised biodiversity hotspots. Of the Succulent Karoo hotspot, about 31% also occur within the province. Legally recognised protected areas cover approximately 13% of the province, with an additional 34% of the land area identified as critical for biodiversity conservation.

A constantly increasing population is creating a need for more economic and residential development, which is directly related to habitat fragmentation, degradation and loss, resulting in increasing pressure on ecological infrastructure. The latter is important for providing vital ecosystem services that underpin social development and economic activity, including services such as the provision of fresh water, buffers against flooding and erosion, rangelands for grazing, climate and air quality regulation, soil formation, as well as recreational spaces.

The availability of fresh water resources is key to the socio-economic development of the Western Cape, particularly since the province is a relatively water-scarce area. As a result of the semi-arid nature of the country and increased water demand linked to economic growth, the water resources in the Western Cape are under great threat. Freshwater ecosystems comprise of rivers, watercourses and wetlands, and form an important basis for ecological infrastructure.

The vision of the Western Cape Biodiversity Spatial Plan

is that biodiversity and ecological infrastructure are highly valued as assets, integrated into all planning spheres, and managed in a sustainable way so as to ensure the persistence of healthy, functioning and representative ecosystems and associated services which benefit all.

Nigel Forshaw

The Western Cape has an extensive coastline of just over 1000 km, and coastal and marine biodiversity are threatened by several factors including increased fishing effort, coastal development, reduced freshwater flows into the estuarine and marine environments, pollution, alien invasive species and climate change. The primary cause of biodiversity loss in the Western Cape is the loss of habitat, as is the case globally. Habitat transformation, degradation and fragmentation occur primarily through changes in land use which either result in the outright loss of natural ecosystems, or pressures which impact negatively on habitat condition.

Land use planning and decision-making should strive for sustainable development and therefore requires spatial biodiversity assessments to better inform where and how development takes place. South Africa has dedicated legal, policy and planning tools for biodiversity management and conservation, linked to broader environmental management objectives at national, provincial and local levels, as well as commitments to international biodiversity targets. The country is committed to contribute towards achieving the 17 Sustainable Development Goals, as well as achieving the Aichi Biodiversity Targets. These tools provide a robust framework for implementation of the WCBSP.

The Western Cape has a 25-year history of biodiversity spatial planning, originating with work conducted in the early 1990s. The WCBSP is a product that builds on previous systematic biodiversity planning efforts undertaken across the province over the last quarter century; now explicitly incorporating data for over 2600 species, ecosystem types and ecological features. The WCBSP also replaces all previous products as best available science to inform current land use planning and should be used as the official reference for biodiversity priority areas to be taken into account in decision-making. The BSP Map can be used to inform a range of key planning processes, including Integrated Development Plans, Spatial Development Frameworks, zoning schemes, environmental impact assessments, and environmental authorisations.

The WCBSP reflects important advances in biodiversity planning in the province over the last few years. Importantly, the WCBSP: (1) provides, for the first time, a singular province-wide assessment; (2) utilises more recent and accurate land cover data than previous assessments; (3) gives explicit consideration to ecological infrastructure and climate resilience; (4) responds to the need for greater conflict avoidance with urban areas; (5) identifies depleted ecosystem/environmental stocks; and (6) incorporates better quality and more up-to-date biodiversity data.

The Handbook is structured according to five chapters:

CHAPTER 1

Explains what a biodiversity spatial plan is, how it should be used and by whom. Describes the legislative and policy context for implementing the Biodiversity Spatial Plan, and how this plan aligns with other planning processes and instruments.

CHAPTER 2

Describes key features of the biodiversity and ecological infrastructure of the Western Cape. Provides a brief overview of the main patterns of land use and other drivers of change that impact on biodiversity, and provides information on the Protected Area network and mechanisms for consolidation and expansion of such a network.

CHAPTER 3

Presents the final spatial product, including the various map categories used. Outlines the approach taken, explaining how the principles of systematic biodiversity planning were adhered to, the data layers and targets used, and other key parameters of the analysis. Concludes with a summary of advances made with the production of the WCBSP.

CHAPTER 4

Provides guidelines for land use planning and decision-making, and for land and resource management using the BSP Map. All the guidelines are informed by the 'Desired Management Objective' for the different categories included in the BSP Map, as well as the relative impact of a land use activity on biodiversity.

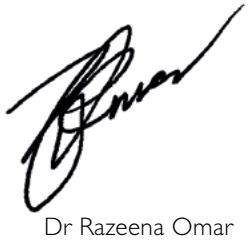
CHAPTER 5

Includes other useful resources, such as frequently asked questions and information on related legislation.

The WCBSP has been developed at a relatively fine spatial scale (1:10 000 – 1:50 000) and can therefore be easily aligned to planning at local, district and provincial levels. Use of the BSP Map ensures that biodiversity opportunities and constraints are incorporated proactively into integrated development planning and land use decision-making, and strengthens decision-making regarding infrastructure investment and economic development.

This product was developed by CapeNature, in collaboration with the Department of Environmental Affairs and Development Planning. The production of this Handbook greatly benefitted from the strategic insight of the Department, as well as financial assistance forthcoming from the Global Environment Facility through the United Nations Development Programme, for which we are truly grateful. The WCBSP is available from SANBI's BGIS Unit on (021) 799 8738, or downloadable from their website http://www.bgis.sanbi.org (South Africa's biodiversity portal).

We trust that this Handbook will be widely used as an indispensable reference to all who work tirelessly towards achieving sustainable development while, at the same time, also ensuring the future of the Western Cape's irreplaceable wealth of biological diversity.



Dr Razeena Omar

CEO: Western Cape Nature Conservation Board

Acronyms

BioNet	Biodiversity Network of the City of Cape Town
BMP-S	Biodiversity Management Plan Species
BSP	Biodiversity Spatial Plan
CAPE	Cape Action for People and the Environment
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CBD	Convention on Biological Diversity
CCT	City of Cape Town
CFR	Cape Floristic Region
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMA	Catchment Management Agency
CR	Critically Endangered
CR PE	Critically Endangered Presumed Extinct
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning Western Cape
DMR	Department of Mineral Resources
DoA	Department of Agriculture Western Cape
DoE	Department of Energy
DoT	Department of Tourism
DRDLR	Department of Rural Development and Land Reform
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EN	Endangered
ESA	Ecological Support Areas
FEPA	Freshwater Ecosystem Priority Areas
FPA	Fire Protection Association
GIS	Geographical Information System
IDP	Integrated Development Plan
LED	Local Economic Development
LUPA	Western Cape Land Use Planning Act
LC	Least Concern
LT	Least Threatened
MAB	Man and the Biosphere Programme

MCA	Mountain Catchment Area
MPA	Marine Protected Area
MPRDA	Mineral and Petroleum Resources Development Act
NBA	National Biodiversity Assessment
NBF	National Biodiversity Framework
NBSAP	National Biodiversity Strategy and Action Plan
NEM:BA	National Environmental Management: Biodiversity Act
NEM:PAA	National Environmental Management: Protected Areas Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NGO	Non-governmental Organisation
NN	No Natural
NPAES	National Protected Area Expansion Strategy
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
ONA	Other Natural Area
PA	Protected Area
PASA	Petroleum Agency South Africa
PBSAP	Western Cape Provincial Biodiversity Strategy and Action Plan
SACNASP	South African Council for Natural Scientific Professions
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SPC	Spatial Planning Category
SPLUMA	Spatial Planning and Land Use Management Act
TMF	Table Mountain Fund
UNESCO	United Nations Environmental Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VU	Vulnerable
WCBB	Western Cape Biodiversity Bill
WCBF	Western Cape Biodiversity Framework
WCBSP	Western Cape Biodiversity Spatial Plan
WCPAES	Western Cape Protected Areas Expansion Strategy
WWF-SA	World Wide Fund for Nature South Africa

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01 Introduction to the Western Cape Biodiversity Spatial Plan

IN THIS CHAPTER:

This chapter introduces the Western Cape Biodiversity Spatial Plan and the reasons why this is needed in the province. It explains what a biodiversity spatial plan is, how it should be used and by whom. It also describes the legislative and policy context for implementing the Biodiversity Spatial Plan, and how this plan aligns with other planning processes and instruments.

The Western Cape Biodiversity Spatial Plan (WCBSP) is a spatial tool that forms part of a broader set of national biodiversity planning tools and initiatives that are provided for in national legislation and policy. It comprises the Biodiversity Spatial Plan Map of biodiversity priority areas, accompanied by contextual information and land use guidelines that make the most recent and best quality biodiversity information available for use in land use and development planning, environmental assessment and regulation, and natural resource management.

This Handbook presents the WCBSP Map and explains how this was developed, and how and when it should be used. It describes the ecosystems and important biodiversity features of the Western Cape and presents a set of land use guidelines and other tools that can be used to effectively aid in conserving the biodiversity of the Western Cape as part of living landscapes that combine multiple land uses. This information is presented in five chapters, as follows:

Chapter 1: Introduction

Chapter 2: Biodiversity Profile for the Western Cape Province

Chapter 3: Spatial Assessment and Map Products

Chapter 4: Guidelines for Land Use Planning and Decision-Making

Chapter 5: Other Useful Resources

A separate Biodiversity Spatial Plan Technical Report (Pence 2017), with details of all the data layers and analyses, is held by the Scientific Services division of CapeNature, and is available on request, or downloadable from the BGIS website (http://bgis.sanbi.org/).

1.1 Context of the Western Cape Biodiversity Spatial Plan

The Western Cape Nature Conservation Board (CapeNature) is mandated to conserve the unique natural heritage resources of the Western Cape for the benefit of all. The responsibility for conserving the Western Cape's biodiversity, however, also lies with many other state agencies within national, provincial and local spheres of government, supported by organisations in the private sector and civil society.

Biodiversity refers to the variety of life on Earth, including genes, species and ecosystems, and the ecological and evolutionary processes that allow these to persist over time. Biodiversity is important not only because of its own intrinsic value, but also because it is the natural capital that enables human communities to build sustainable livelihoods and attain an adequate quality of life. It is one of the critical elements supporting the ecological infrastructure on which socio-economic development and human well-being depend.

Ecological infrastructure[1] is the nature-based equivalent of hard infrastructure, such as roads, bridges and water pipelines, and is just as important for providing the vital services that underpin social development and economic activity. It is the stock of functioning ecosystems that provides a flow of essential ecosystem services to human communities – services such as the provision of fresh water, buffers against flooding and erosion, rangelands for grazing, climate and air quality regulation and soil formation.

The biodiversity and ecological infrastructure of the Western Cape is a valuable, but vulnerable, asset that could be a rich source of natural solutions to the challenges posed by poverty, unemployment, and climate change. For this potential to be realised, land use planners and managers in a wide range of sectors need good scientific information that is effectively interpreted and made available to end-users; well-capacitated institutions that are responsible for effective management and governance of biodiversity assets; and well-informed policies, legislation and leaders. The Western Cape Biodiversity Spatial Plan is an important tool for addressing these needs.

Much of the current conservation effort in South Africa is focused on promoting land use practices that reconcile development opportunities and spatial planning at a landscape scale, with the over-arching goal of maintaining and increasing the resilience of ecosystems, especially in the face of climate change (See Section 2.7.2). This 'landscape approach' to biodiversity conservation involves working within and beyond the boundaries of protected areas to manage biodiversity within a mosaic of land uses.

People who do not necessarily have a background in biodiversity or conservation are increasingly being called upon to exercise decision-making powers in such a way that economic goals can be achieved whilst the health of ecosystems is maintained, and the loss of important or threatened species or habitats is avoided. Ideally, all land users and people who make decisions about the use of the Western Cape's natural resources should be aware of spatial biodiversity priorities within the province, and should understand their management requirements and what land uses are appropriate in different parts of the landscape. This is so that they can proactively identify the ecological opportunities and constraints within a landscape, and use them to locate and manage infrastructural developments and other land uses most appropriately.


Marie-Adèle de Villiers

1 http://biodiversityadvisor.sanbi.org/wp-content/uploads/2014/07/2013_Ecological-infrastructure-factsheet.pdf

To do this, individuals and institutions need to be equipped with reliable, up-to-date spatial biodiversity information and land use guidelines that ensure biodiversity is sufficiently considered – and safeguarded – in their decisions, plans and activities. This need is fulfilled by the WCBSP.

The main purpose of a biodiversity spatial plan is to ensure that the most recent and best quality spatial biodiversity information can be accessed and used to inform land use and development planning, environmental assessments and authorisations, natural resource management and other multi-sectoral planning processes. A biodiversity spatial plan achieves this by providing a map of terrestrial and freshwater areas that are important for conserving biodiversity pattern and ecological processes – these areas are called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). The map is provided together with contextual information on biodiversity, and land use guidelines (see Figure 1.1) that can be incorporated into the policies and decisions of a wide range of sectors.

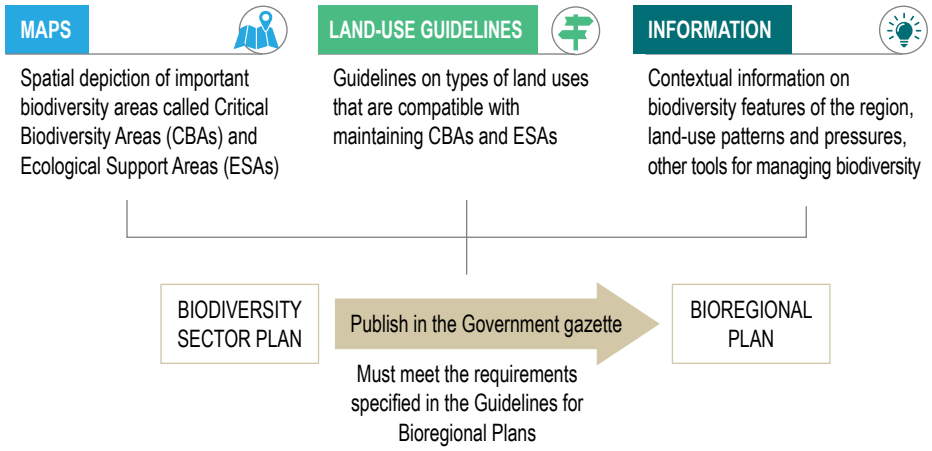

FIGURE 1.1: Components of a Biodiversity Spatial Plan and its relationship to a Bioregional Plan

A biodiversity sector/spatial plan is based on a systematic biodiversity assessment and has boundaries aligned with administrative boundaries (e.g. municipality, province). It is comprised of the following components:

- a Map of biodiversity priority areas (or separate maps for freshwater and terrestrial biodiversity priority areas), derived through a systematic biodiversity planning approach – note that this map is called the BSP Map for short, even though the map includes several categories of biodiversity priority areas, including Critical Biodiversity Areas and Ecological Support Areas;
- a Handbook that includes a biodiversity profile and land use guidelines;
- Geographic Information System (GIS) files; and
- a Technical Report.

The Western Cape Biodiversity Spatial Plan is available from SANBI's BGIS Unit on (021) 799 8738 or downloadable from their website http://www.bgis.sanbi.org (South Africa's biodiversity portal).

The WCBSP is a core component of the Provincial Biodiversity Strategy and Action Plan (PBSAP) as it is used to spatially prioritise conservation action (such as protected area expansion or investment into ecological infrastructure), or to feed spatial biodiversity priorities into planning and decision-making in a wide range of cross-sectoral planning processes and instruments such as development applications in terms of the National Environmental Management Act (NEMA), the Spatial Planning and Land Use Management Act (SPLUMA),

the Western Cape Land Use Planning Act (LUPA), the Provincial Spatial Development Framework and municipal integrated development plans (IDPs), spatial development frameworks (SDFs), land use management schemes and environmental management frameworks (EMFs). A biodiversity spatial plan can be gazetted in terms of the National Environmental Management: Biodiversity Act (NEM:BA) as a Bioregional Plan, which will require it be taken into account in land use planning and decision-making (See Box 1.1). Alternatively, a biodiversity spatial plan can be adopted by the competent authority in terms of NEMA, in order to allow for the relevant Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations to be realized. The Western Cape also intends making provision for systematic biodiversity plans in provincial biodiversity legislation currently being drafted.[2]

Box 1.1 **Bioregional Plans in terms of NEM:BA**

A bioregional plan is a map showing Critical Biodiversity Areas and Ecological Support Areas for an administrative region e.g. municipality, province, with accompanying land- and resource-use guidelines, which has been published in terms of the NEM:BA. A bioregional plan must meet specific requirements that are laid down in the Guideline for Bioregional Plans[2]. It must be based on a systematic biodiversity plan and serves the same purpose as a biodiversity spatial plan. Prior to publishing, the map must go through a consultation process to ensure it is consistent with other relevant municipal plans and frameworks. The main difference between a biodiversity spatial plan and a bioregional plan is that the latter has been published in the Government Gazette and therefore has legal standing in terms of NEM:BA. After its publication, a bioregional plan must be taken into account in all future land use planning and decision-making.

The systematic biodiversity assessment along with the land use guidelines and biodiversity profile as contained within this Handbook and together comprising the Western Cape Biodiversity Spatial Plan, can then be considered a provincial sector plan in terms of Section 26 of the Local Government: Municipal Systems Act (Act 32 of 2000), and can therefore also be referred to as the Biodiversity Sector Plan. In terms of the above-mentioned section of the Act, the municipal council's development strategies as contained within the IDP must be aligned with any national or provincial sectoral plans.

1.2 Scope, Objectives and Uses of the Western Cape Biodiversity Spatial Plan

The WCBSP is an up-to-date plan that identifies a province-wide network of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) that:

- achieve national and provincial biodiversity targets on the least amount of land possible;
- have the least conflict with other forms of land use;
- favour areas that are important for freshwater ecosystems and water security; and
- promote adaptation to climate change and connectivity across the landscape.

1.2.1 Scope of the Biodiversity Spatial Plan

The WCBSP covers the whole Province, which is divided into five District Municipalities: West Coast, Cape Winelands, Overberg, Eden and Central Karoo and one Metropolitan Municipality: City of Cape Town (see Figure 1.2).

2 Guideline regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans. April 2008. Government Gazette No. 32006, 16 March 2009.

The WCBSP planning domain is flanked by two existing provincial biodiversity plans, namely in the Northern Cape and Eastern Cape where biodiversity spatial plans are currently under development. Extensive consultation with the relevant planning teams in these provinces has been undertaken to ensure that the data sets and approaches have been harmonized as far as possible to ensure cross-border consistency and spatial linkages.

The WCBSP has been developed at a relatively fine spatial scale (1:10 000 – 1:50 000) that can be used for planning at local, district and provincial levels. It supports the principles of integrated development planning, and integration with IDPs and SDFs has been addressed in consultation with stakeholders in government, civil society and the private sector. Because the WCBSP has been developed at a fine scale, it can be easily aligned to district and local municipal boundaries for the purposes of plans at the local government level.

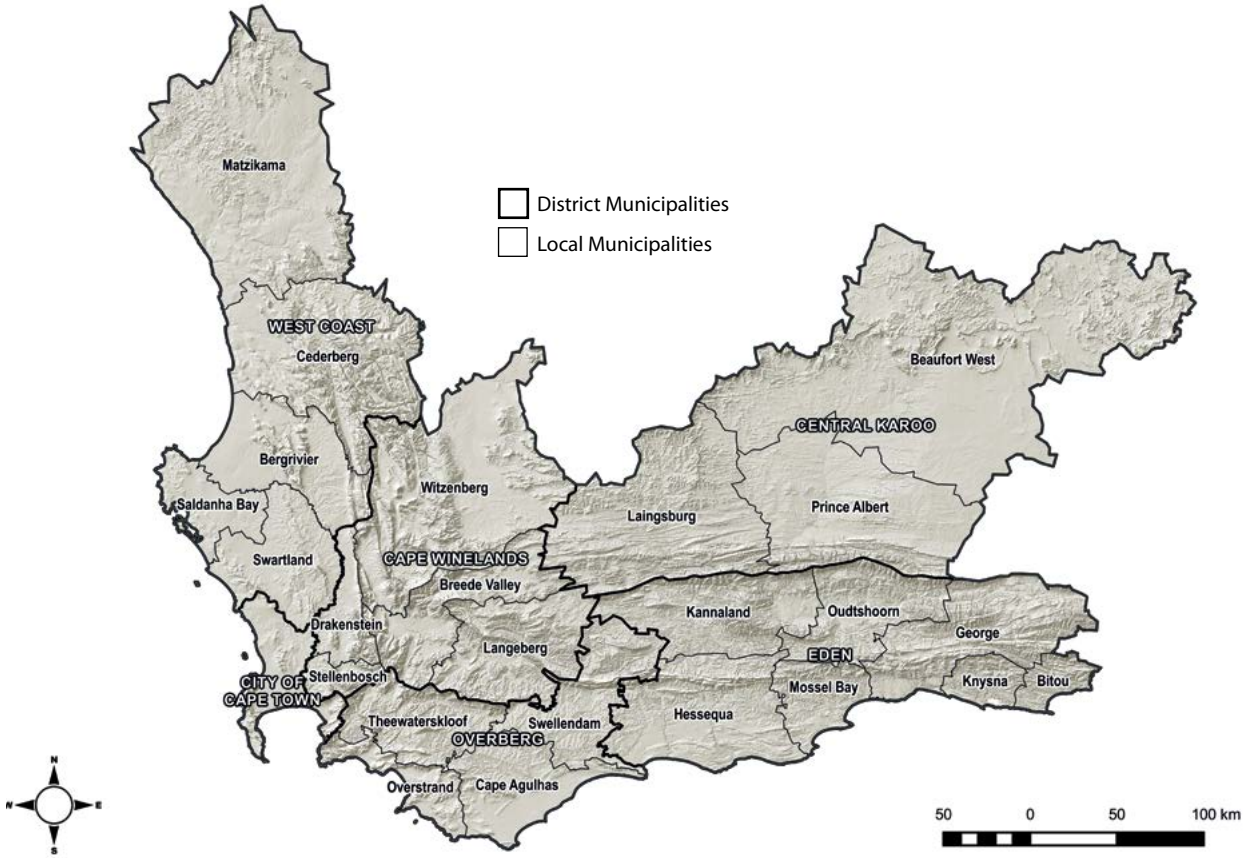

FIGURE 1.2: Map of the Western Cape showing five District Municipalities, one Metropolitan Municipality and 24 Local Municipalities

1.2.2 Vision and Objectives of the Biodiversity Spatial Plan

The vision of the Western Cape Biodiversity Spatial Plan *is that biodiversity and ecological infrastructure are highly valued as assets, integrated into all planning spheres, and managed in a sustainable way so as to ensure the persistence of healthy, functioning and representative ecosystems and associated services which benefit all.*

The WCBSP's specific **objectives** are to:

- Serve as the primary source of biodiversity information for all land use planning and decision-making in the Western Cape, to be used in conjunction with information from other sectors.
- Ensure that the Western Cape's ecological infrastructure is maintained, ecosystem fragmentation and loss is avoided, and the resilience of ecosystems and human communities to the impacts of climate change is strengthened.

- Provide a spatial framework for environmentally sustainable development and resource use.
- Inform municipalities and other land use planners and regulators about spatial biodiversity priorities in order to promote the wise management of biodiversity, and to streamline and monitor land use decision-making.
- Focus on-the-ground conservation and restoration action in biodiversity priority areas, thus supporting CapeNature in implementing its biodiversity mandate, including working with landowners to consolidate and expand the provincial protected area network.
- Mainstream biodiversity conservation into the daily activities of a range of development and production sectors whose primary business is not biodiversity conservation, thus promoting greater synergy between biodiversity conservation and development through implementation of the WCBSP.

1.2.3 Systematic Biodiversity Planning in the Western Cape leading to the development of the Biodiversity Spatial Plan

The Western Cape has a 25-year history of biodiversity spatial planning, originating with the work of Rebelo and Siegfried in the early 1990s on conserving Fynbos species using Proteaceae distribution records (Rebelo & Siegfried 1992). By 1999, Cape ecologists and conservation scientists had succeeded in securing Global Environment Facility (GEF) funds which supported the Cape Action for People and the Environment (C.A.P.E.) programme and the work lead by Richard Cowling that elevated Cape conservation scientists to the leading edge of systematic biodiversity planning globally (Van Wilgen *et al.* 2016). The WCBSP is a product that builds on these and other systematic biodiversity planning efforts undertaken across the province over the last quarter century. The WCBSP also replaces them as best available science to inform current land use planning and decision-making – with the exception of the City of Cape Town's Biodiversity Network (BioNet).

Notably in the development of biodiversity planning in the province, CapeNature and the South African National Biodiversity Institute (SANBI) partnered together in 2007 on the GEF-funded C.A.P.E. Fine-Scale Planning Project; an effort to develop spatial biodiversity plans at a scale appropriate for municipal planning and for informing farm-level environmental authorisations. The project produced systematic biodiversity plans and land use guidelines for five broad conservation priority areas in the Cape Floristic Region (North-West Sandveld, Saldanha Peninsula, Nieuwoudtville, Upper Breede River Valley, and Riversdale Plain), covering nine local municipalities in the Western Cape at a scale of 1:10 000 (Matzikama, Cederberg, Bergrivier, Saldanha Bay, Witzenberg, Breede Valley, Langeberg, Hessequa, and Mossel Bay).

Following on from the success of this project, systematic biodiversity plans were developed for the Central Karoo District Municipality, Overberg District Municipality, the Garden Route (Eden), and the WCDMA01 (now the northern half of Matzikama Municipality). Biodiversity Sector Plan handbooks were also developed for some regions, e.g. the Hessequa and Mossel Bay Municipalities (Maree & Vromans 2010a), and Saldanha Bay, Bergrivier, Cederberg and Matzikama Municipalities (Maree & Vromans 2010b).

The City of Cape Town conducted its first systematic biodiversity planning study in 2002, which culminated in the Biodiversity Network Prioritization Report (2004). Since then their Biodiversity Network, or BioNet, has been reliably updated with ground-truthed data and methodological improvements (for example, to more explicitly take climate change considerations into account; see Holmes & Pugnalin 2016). In 2015, the BioNet together with management guidelines was adopted as official policy by the City of Cape Town Council[3].

The above plans were consolidated into the Western Cape Biodiversity Framework (WCBF) in 2010. This process consisted of aligning and amalgamating the existing products to form a single integrated map for the Western Cape Province. The only municipalities for which there were no detailed precursory systematic biodiversity plans in place were Stellenbosch, Drakenstein and Swartland. Desktop land cover, vegetation, and species occurrence data were however used to develop basic CBA maps for these regions.

The WCBF was updated in 2014. This was not however a recalculation or reconfiguration of the 2010 CBAs, but rather an attempt to: highlight and quantify the loss of CBAs in the province; to assess the degree to which they met national biodiversity targets; and to make the case for a single, province-wide systematic biodiversity plan. Importantly, the 2014 study concluded that this required more up-to-date data, particularly land cover data, to better inform planning and land use decision-making in the Western Cape.

Thus, the spatial plan accompanying this Handbook has grown out of this rich history of spatial biodiversity planning and planning products, and represents the first-ever province-wide assessment of Critical Biodiversity Areas and Ecological Support Areas. The product makes use of more up-to-date data than ever before, thereby reflecting habitat loss since previous products, and covers both terrestrial and aquatic realms, as well as coastal and estuarine habitats. The WCBSP used a systematic biodiversity planning approach to identify priority areas that meet both national and provincial targets in an efficient manner, emphasizing landscape resilience to a changing climate, and while trying to avoid conflict with other land uses.

It is important to note that the WCBSP *replaces* all the earlier systematic biodiversity planning products for the Western Cape (including the Western Cape Biodiversity Framework products of 2010 and 2014) and should be used as the official reference for biodiversity priority areas to be taken into account in land use planning and decision-making in the province.

3 Policy Number 44854, 19 August 2015.

1.2.4 Intended Users of the Biodiversity Spatial Plan

The WCBSP should be used by all sectors involved in land use planning and decision-making in the Western Cape to ensure the persistence of biodiversity assets and ecological infrastructure and the delivery of vital ecosystem services. This includes users (e.g. organs of state) who are *required* to use the plan to meet legislative or policy requirements, and those users who will find it a *useful* informant to their planning processes (e.g. regional natural resource management programmes, environmental consultants, conservation NGOs and private landowners).

The main users of the WCBSP are expected to be:

- **National and provincial government departments** – in particular, though not limited to, officials, planners and scientists:
  - Environmental Affairs (DEA and DEA&DP)
  - Water Affairs and Sanitation (DWS)
  - Agriculture, Forestry, Fisheries (DAFF and DoA)
  - Development Planning, Spatial Planning, Rural Development and Land Reform (DRDLR and DEA&DP)
  - Biodiversity Conservation (SANParks and CapeNature)
  - Tourism (DoT)
  - Mineral and Petroleum Resources (DMR and PASA)
  - Energy (DoE);
- Spatial planners, land use regulators and other officials in **municipalities** (both district and local);
- **Environmental professionals** including planning and environmental assessment practitioners, biodiversity and conservation scientists in research institutions, the private sector and civil society organisations;
- **Natural resource management programmes**, such as Working for Water and Working for Wetlands;
- **Landowners** contemplating changes in land use on their land.

Although the primary users of the WCBSP might largely be technical people, an effort has been made to make the BSP Map meaningful to non-technical people. Widespread public understanding of the WCBSP is vital for its effective long-term implementation and success.

1.2.5 Intended Uses of the Biodiversity Spatial Plan

The BSP Map and guidelines can be used for four main types of applications in day-to-day land- and resource-use decisions (see also Chapter 4):

Development applications: such as EIA authorisations under NEMA; agricultural land use decisions (e.g. cultivation licenses) under the Conservation of Agricultural Resources Act (CARA); water-use licensing under the National Water Act; authorisations for prospecting and mining under both the Mineral and Petroleum Resources Development Act (MPRDA) and NEMA, and land use planning decisions in terms of both SPLUMA and LUPA.

Proactive forward-planning: such as the incorporation of CBAs, ESAs and the land use guidelines into IDPs, SDFs; SEAs; EMFs, Land Use Management Schemes, Zoning Schemes, and other forward-planning under SPLUMA; allowing developers to avoid CBAs in their own planning processes; informing the development of Terms of Reference for biodiversity specialists in EIAs.

Proactive conservation: such as identifying land of high biodiversity value for the expansion and consolidation of protected areas, either through biodiversity stewardship agreements, land acquisition or other tools that may be developed. The Western Cape Protected Areas Expansion Strategy has been developed to specifically address proactive conservation, however this in itself was derived from the Provincial Spatial Biodiversity Plan.

Restoration: such as identifying priority biodiversity areas requiring restoration or other action to improve the condition of the environment and restore biodiversity pattern and ecological processes.

Although the underlying data used to generate the WCBSP is the most up-to-date, accurate and scientifically defensible as possible, it should be noted that:

- The BSP Map cannot replace the need for on-site field assessments in land use applications and EIAs. It should further be noted that botanical specialists should however take into consideration the WCBSP which accounts for the broader landscape scale processes using systematic biodiversity planning principles as well as the more detailed finer scale site specific field mapping in their botanical assessments, bearing in mind the 30 m resolution of the land cover data;
- The WCBSP cannot be used in isolation, or to the exclusion of other spatial planning tools;
- The WCBSP is not in itself a multi-sectoral planning tool, but rather is the biodiversity sector's input into other planning and assessment processes. However, it is intended that the WCBSP should be considered to be the primary spatial biodiversity informant in the Western Cape, and any other spatial biodiversity products should use the WCBSP as an initiation point.

1.3 The Legislative and Policy Framework for Implementation

In South Africa, there are dedicated legal, policy and planning tools for biodiversity management and conservation, linked to broader environmental management at national, provincial and local levels. These tools provide a robust framework for implementation of the WCBSP.

1.3.1 National and Provincial legislation and policy

The Constitution of South Africa, and its associated Bill of Rights, creates the overall framework for environmental governance in the country. Although the Constitution does not specifically refer to "biodiversity", it enshrines certain environmental rights and specifies various powers and functions of national and provincial governments in terms of "the environment", "nature conservation" and "natural resources" such as soil, water, forests and marine resources. In keeping with these Constitutional provisions, three key pieces of national legislation collectively set out the principles and procedures governing biodiversity management in the country:

- National Environmental Management Act, Act 107 of 1998 (NEMA), as amended;
- National Environmental Management: Protected Areas Act, Act 57 of 2003 (NEM:PAA), as amended;
- National Environmental Management: Biodiversity Act, Act 10 of 2004 (NEM:BA) as amended.


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The WCBSP is consistent with the provisions of NEMA and the Western Cape Biodiversity Assessment and supports the implementation of the NEM:BA, NEM:PAA, the National Biodiversity Framework of 2008[4], the National Protected Areas Expansion Strategy (DEA 2008), the Western Cape Provincial Biodiversity Strategy and Action Plan, the Western Cape Protected Areas Expansion Strategy and Implementation Plan (Western Cape Government 2015) and South Africa's commitments in terms of several international agreements to which it is a signatory, such as the Convention on Biological Diversity (CBD 1993), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973), Convention on Wetlands (known as the 'Ramsar Convention', 1971) and the United Nations Framework Convention on Climate Change (UNFCCC 1994). In addition, the WCBSP is supporting the country's contribution towards achieving the 17 Sustainable Development Goals (also known as the Global Goals) and the Aichi Biodiversity Targets.

For summaries of the more important national and provincial legislation and policies relating to land use planning and environmental regulation, as well as to water, forests, and agricultural resources, refer to Section 5.2 for additional detail.

1.3.2 Alignment with national biodiversity planning tools

Two key national biodiversity planning instruments with which the WCBSP is aligned are the:

- National Biodiversity Assessment of 2011 (Driver *et al.* 2012);
- Atlas of Freshwater Ecosystem Priority Areas in South Africa (Nel & Driver 2012).

The WCBSP is a scientifically defensible, systematic, detailed and quantified provincial contribution to the country-wide biodiversity planning effort. It will be used as the basis for gazetting of systematic biodiversity plans in the Western Cape, of which the WCBSP is proposed in itself for gazetting (see Box 1.2).

Box 1.2 What is a Systematic Biodiversity Plan

Systematic biodiversity planning involves mapping information about biodiversity features and patterns of land and resource use, setting biodiversity targets and then analysing the information using specialised software programmes linked to Geographical Information Systems (GIS). The process for developing a systematic biodiversity plan is outlined in more detail in Chapter 3.

Using these methods, maps are generated to indicate where natural resource management and conservation action should be focused and to assess the implications of different land use options for biodiversity. Biodiversity plans at different spatial scales answer different questions and can be applied in different ways. The resulting maps can be used to plan conservation interventions, but are also used cross-sectorally to ensure that biodiversity opportunities and constraints are incorporated proactively into integrated development planning and land use decision-making, and to strengthen decision-making regarding infrastructure investment and economic development.

4 South Africa's National Biodiversity Framework, 2008. Minister of Water and Environmental Affairs, Government Gazette No. 32474, 3 August 2009.

1.3.3 The policy context for integrating the Biodiversity Spatial Plan into spatial planning at the local level

Land use planning and decision-making are carried out within a specific context that is defined by laws, regulations and zoning schemes that govern which land uses are permissible in certain areas. Responsibility for spatial planning is shared across all three spheres of government, with powers and functions within each sphere determined by a number of different pieces of legislation. A nested system of strategic development and spatial planning at national, provincial and local levels provides multiple opportunities to embed biodiversity considerations into land use planning and decision-making processes (see Box 1.3).

Over the past 20 years, local municipalities have come to play an increasingly important role as users and managers of biodiversity, and it is at local government level that many day-to-day, operational decisions about land and biodiversity resources are made. The Constitution assigns municipal planning to local government and makes provision for municipalities to decide over all land use decisions within their borders and the recently promulgated SPLUMA sets out a framework for alignment between environmental management instruments (including biodiversity plans), SDFs and municipal land use schemes. IDPs and SDFs provide an important and strategic opportunity to incorporate biodiversity information into decisions relating to the location of infrastructure developments (e.g. housing developments), the provision of services (e.g. water pipelines), environmental management and economic activities that provide employment opportunities and enhance livelihoods.

The wide range of legislation dealing with various aspects of natural resource management, together with the three-sphere system of government, has resulted in a large number of government departments and agencies being responsible for biodiversity and protected area management in the country. The existence of a province-wide biodiversity spatial plan that is endorsed by government, means that all agencies can work to the same set of spatial biodiversity priorities and land use guidelines, thus promoting more strategic and co-ordinated action in the Western Cape.

Box 1.3 **Key National and Provincial Legislation and Planning Products of relevance to implementation of the WCBSP**

Outcome 10: Environmental Assets and Natural Resources that are Well Protected and Continually Enhanced

The Medium Term Strategic Framework for the government of South Africa is an expression of the government's programme of action which identified 12 key outcomes. Outcome 10 includes four outputs of which Output 4 is Protected Biodiversity, which includes four sub-outputs. Under sub-output Protected Ecosystems and Species, it includes the action of targeted protection of priority habitats and the deliverable of bioregional plans and biodiversity sector plans. Various other outputs and deliverables refer to incorporating environmental considerations into IDPs, SDFs, SEAs and EMFs[5] (http://www.gov.za/issues/outcomes-approach).

5 http://www.gov.za/sites/www.gov.za/files/Outcome%2010%20Delivery%20Agreement%2023%20September2010_1.pdf

The National Environmental Management: Biodiversity Act (Act 10 of 2004, as amended)

The Biodiversity Act provides for the co-ordinated management, conservation and sustainable use of biodiversity across the whole country. It promotes an ecosystem-orientated approach to the management of biodiversity, taking into account the need for social transformation and development goals to be met, and recognising that biodiversity conservation involves working beyond the boundaries of formal protected areas. The Biodiversity Act introduced a new set of biodiversity planning and management tools that have legal standing – including listed Threatened Ecosystems and Bioregional Plans.

The National Environmental Management: Protected Areas Act (Act 57 of 2003, as amended)

The Protected Areas Act provides for the formal protection of a network of ecologically viable areas that are representative of South Africa's biodiversity and natural landscapes. It establishes a consistent set of legal requirements for the management of national, provincial and local protected areas, and aims to balance the relationships between biodiversity conservation, human settlement and economic development. The Protected Areas Act also allows for the declaration of a protected area on private or communal land and for the landowner to be recognised as the management authority of the protected area.

The National Protected Areas Expansion Strategy (NPAES, 2008)

South Africa's first NPAES was published in 2008, with the goal of achieving cost-effective expansion of the protected area network that enhances ecological sustainability and resilience to climate change. It was in part a response to the National Spatial Biodiversity Assessment, 2004, which highlighted that many ecosystems in South Africa were under-protected. The NPAES sets national-scale ecosystem-specific targets for protected area expansion across the country, identifies geographic focus areas for land-based protected area expansion, and makes recommendations about mechanisms for protected area expansion. It serves as the over-arching framework and catalyst for the development of provincial protected area expansion strategies.

The National Biodiversity Framework (NBF, 2008)

The Biodiversity Act requires the Minister of Environmental Affairs to develop a National Biodiversity Framework (NBF) and to review it every five years. The first NBF was published in 2008, informed by the National Spatial Biodiversity Assessment (NSBA 2004) and the National Biodiversity Strategy and Action Plan (NBSAP 2005). The purpose of the NBF is to co-ordinate and align the efforts of the organisations and individuals involved in conserving and managing South Africa's biodiversity. While the NBSAP is comprehensive and long-term, the NBF focuses on the most urgent strategies and actions that can make the biggest difference in the shorter term. The NBF 2008 identified 33 priority actions for the period 2008 – 2013, organised under five strategic objectives (one of which is developing provincial biodiversity spatial plans). These provide a high-level framework for prioritising conservation action within the provincial context. The NBF will be revised, following the review of the NBSAP (which was initiated in 2013).


Deon Geldenhuys

Western Cape Provincial Biodiversity Strategy and Action Plan (PBSAP)

The PBSAP is a ten-year strategy that aligns with the National and Provincial Medium Term Strategic Frameworks 2014–2019 as well as the National Biodiversity Strategy and Action Plan (NBSAP), 2015 to 2025. It integrates South Africa's obligations under the Convention on Biological Diversity (CBD) into the provincial context. The PBSAP is a strategic framework which prioritises and coordinates the collective efforts of the DEA&DP and CapeNature, relevant government departments and entities, municipalities, partners and the local community to ensure that biodiversity and ecological infrastructure in the province is optimally conserved, sustainably utilised and that benefits are equitably shared. PBSAP Overarching Goal: *By 2025 management, consolidation and expansion of all the categories of the Western Cape Province's network of conservation areas; promotion of existing and new biodiversity mainstreaming and conservation initiatives; enabling of an inclusive and sustainable biodiversity based economy; and active participation of citizens, progressively contribute to the attainment of biodiversity conservation, economic and development vision of the Western Cape Province.*

Western Cape Protected Areas Expansion Strategy 2015–2020 (WCPAES)

This strategy is aimed at expanding the protected area network to increase its representivity and resilience, and at regularising the protected area network to ensure compliance with the National Environmental Management: Protected Areas Act (Act 57 of 2003). The strategy is adopted and supported by the Provincial Government of the Western Cape. The primary focus of the WCPAES is twofold: to expand the Western Cape protected area network to encompass a more representative and resilient suite of areas that support biodiversity and ecological infrastructure, especially those threatened species and ecosystems that remain as yet unprotected; and, to regularise existing protected areas, so that environmental security is ensured for everyone in South Africa and the costs and benefits of protection accrue to the appropriate entity.

Western Cape Biodiversity Bill (in progress)

In terms of provincial legislation, it is intended that the Western Cape Biodiversity Act (currently a Bill) will address the implementation of the provincial spatial biodiversity plan. The Western Cape Biodiversity Act will repeal the Nature Conservation Ordinance of the Cape of Good Hope (Ordinance 19 of 1974), the Western Cape Nature Conservation Board Act (Act 15 of 1998) and the Western Cape Nature Conservation Laws Amendment Act (Act 3 of 2000) which is currently the relevant legislation enacted on a provincial level in terms of biodiversity conservation and the governance of CapeNature.

The National Biodiversity Assessment 2011 (NBA)

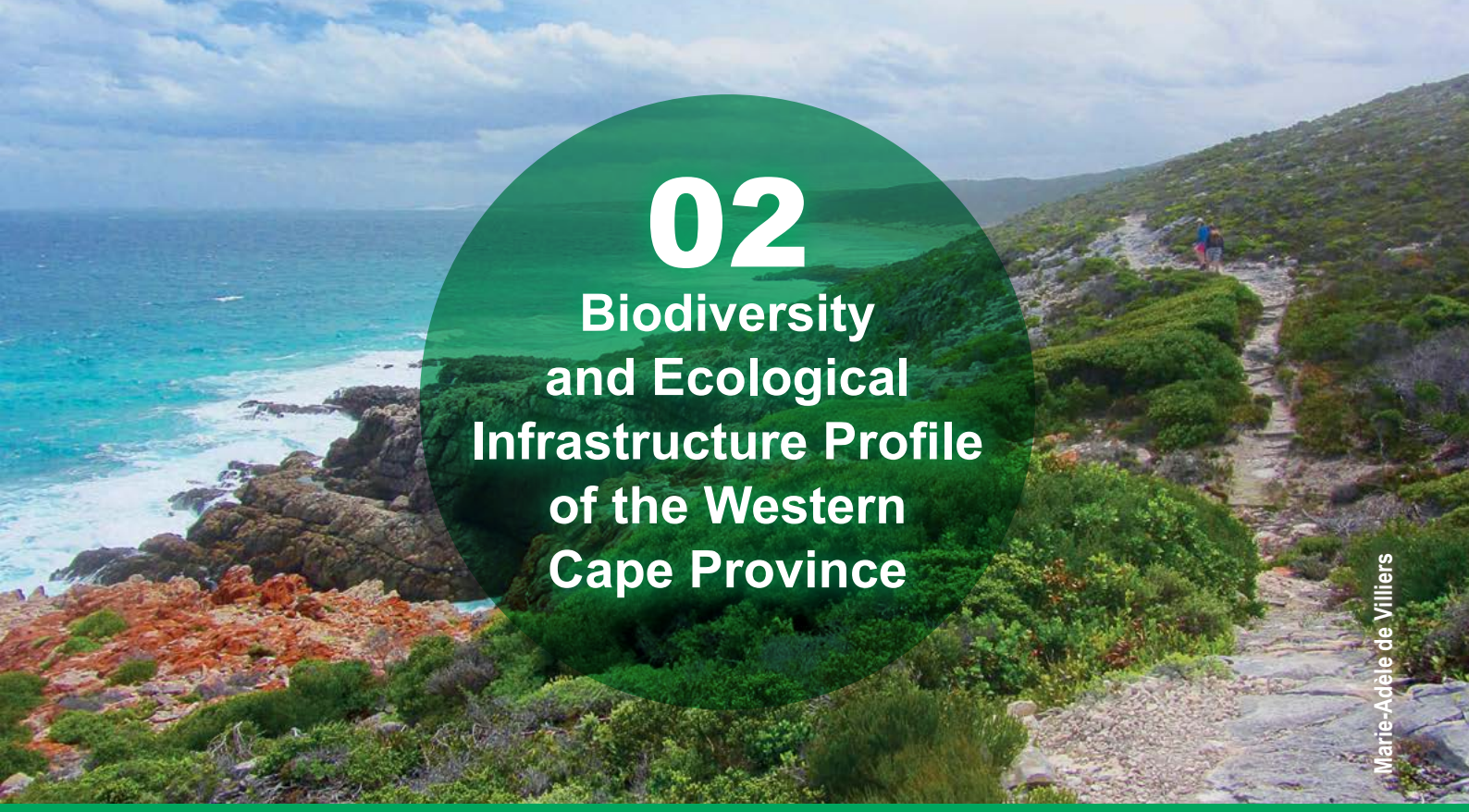
The National Biodiversity Assessment of 2011 (Driver *et al.* 2012) provides a summary of spatial biodiversity priority areas that have been identified through systematic biodiversity planning at national, provincial and local level. It includes headline ecosystem indicators and national maps for terrestrial, freshwater, estuarine and marine environments. It provides standard national spatial data layers that can be used in other national, regional or local planning projects and an agreed set of national biodiversity targets for ecosystems. The NBA products can be used to: streamline environmental decision-making; strengthen land use planning; identify priority areas for management and restoration; provide an initial identification of threatened ecosystems; and to highlight those areas where more detailed planning is required.

Atlas of Freshwater Ecosystem Priority Areas (FEPAs) and the FEPA Implementation Manual

The National Freshwater Ecosystem Priority Areas (NFEPA) project was a collaboration between the CSIR, SANBI, the Department of Water Affairs, the Water Research Commission, SANParks, SAIAB, WWF-SA and the Department of Environmental Affairs. Its purpose was to identify a national network of freshwater priority areas to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and associated species, and to support sustainable use of water resources.

These strategic spatial priorities are known as **Freshwater Ecosystem Priority Areas, or FEPAs**. FEPAs were determined through a process of systematic biodiversity planning based on a range of criteria that are described in detail in the NFEPA Technical Report. The FEPA maps are published in the Atlas of Freshwater Ecosystem Priority Areas in South Africa which is accompanied by an Implementation Manual that provides detailed, practical guidelines for managing land uses and their impacts in the freshwater priority areas (Driver *et al.* 2011).

Scott N Ramsay



02 Biodiversity and Ecological Infrastructure Profile of the Western Cape Province

Marie-Adèle de Villiers

IN THIS CHAPTER:

This chapter describes key features of the biodiversity and ecological infrastructure of the Western Cape, including landscapes and habitats that contain important biodiversity, key terrestrial and freshwater ecosystems, corridors and species of special concern. It also provides a brief overview of the main patterns of land use and other drivers of change that impact on biodiversity.

In addition, information is provided on the protected area network and mechanisms for consolidation and expansion of such a network.

2.1 Introduction

The Western Cape is situated in the south-westernmost part of South Africa, flanked by the Indian Ocean to the south and the Atlantic Ocean to the west and south west, the two oceans meeting at Cape Agulhas, the southernmost point of Africa. The Western Cape is bordered by the Northern Cape to the north and the Eastern Cape to the east. It occupies an area of 129 462 km². Cape Town, the only major city in the province, is located in the south-westernmost corner and is the capital of the province as well as the legislative capital of South Africa.

The Western Cape is predominantly a winter rainfall area, with warm to hot dry summers and cool rainy winters, with a similar climate to other Mediterranean Type Ecosystems located in the Mediterranean Basin, parts of Chile, California, and parts of South-Western and South-Eastern Australia. The source of rainfall mostly originates from mid-latitude cyclones driven from the South Atlantic by westerly winds. In summer, the climatic belts move southwards to be replaced by dry south-easterlies which can often reach gale-force and result in high fire risk. The rainfall is more evenly distributed throughout the year further eastward with non-seasonal rainfall in the Southern Cape. Rainfall decreases further inland, with the Cape Fold Mountains creating a rain shadow effect. The Nama Karoo region in the north-eastern parts of the province has predominantly late summer rainfall which falls in erratic thunderstorms.

The Cape Fold Mountains are the most prominent topographic feature of the Western Cape, which form a north-south axis (including the Cederberg, Groot Winterhoek, and Witzenberg mountain ranges) and an east-west axis (including the Langeberg, Riviersonderend, Outeniquas and Swartberg mountain ranges) and converge in the south-west (Boland Mountains). Further inland, the escarpment which separates the inland plateau from the lower lying coastal areas is located along the boundary with the Northern Cape. The primary rivers of the Western Cape are the Berg, Breede, Olifants and Gouritz Rivers, and each

provide a vital function in terms of the water needs for the various economic sectors in a predominantly arid province. The mountains mentioned above form vital catchments for the rivers, as these regions experience elevated rainfall and the rivers currently experience relatively low impacts within the mountain reaches.

The combination of the high variability of topography, which in turn results in high levels of climatic variation over short distances, variation in altitude/geology/soils and a long history of geological stability and few mass extinction events (e.g. ice ages) has resulted in high levels of speciation within the Western Cape, particularly within the Cape Floristic Region (CFR) and Succulent Karoo Biome. As a result of this, the CFR and Succulent Karoo Biome, which occupy the majority of the province, are global biodiversity hotspots, recognised as having exceptional levels of diversity and endemism. The CFR is also one of the six global Floral Kingdoms and is by far the smallest.

This Biodiversity Profile provides an overview of some of the most important features of the biodiversity and ecosystems of the Western Cape, including a snapshot of each of the Biomes, a description of landscapes or features that are of particular biodiversity value, a brief account of species of special concern and a description of some of the key resource use patterns and agents of habitat change.

Users requiring more detailed, local scale data are referred to the WCBSP Technical Report that underpins the BSP Map.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2.2 Terrestrial Ecosystems

Ecosystems are dynamic complexes of plant, animal and micro-organism communities and their non-living environment, interacting as a functional unit. They can be defined at different scales, from a single vegetation type or community of plants, to a cluster of vegetation types, a wetland or group of wetlands, through to an entire range of mountains. Groups of ecosystems with common bioclimatic characteristics at a landscape scale are called Biomes.

This province is home to the Cape Floral Kingdom or, redefined as the Greater Cape Floristic Region to include the whole winter rainfall area in SA (the Cape Floristic Region or Fynbos, and the Succulent Karoo Biome) (Born *et al.* 2007). The Western Cape furthermore houses two of the 34, or 6%, of the world's Biodiversity Hotspots (Mittermeier *et al.* 2004), five of the nine, or 55%, Biomes found in SA (Mucina & Rutherford 2006), and 163 of 435, or 37%, of the vegetation units of SA (Mucina & Rutherford 2006).

2.2.1 Biomes

The Western Cape is comprised of five different Biomes (with percentages of the total South African extent of the Biomes as contained within the Western Cape in brackets), namely Fynbos (79%), Succulent Karoo (35%), Nama Karoo (11%), Albany Thicket (5%) and Afrotemperate Forest (47%) (Mucina & Rutherford 2006) (see Box 2.1 and Table 2.1). Marginal outliers of the Grassland Biome also extends into the Western Cape (0.03%) however this extent does not warrant further discussion.

The Fynbos Biome is the largest Biome occurring in the Western Cape from along the coastal plain and extending across the Cape Fold Mountains. The CFR includes all vegetation types of the Fynbos Biome and is mostly located within the winter rainfall region. The Fynbos Biome comprises three vegetation types based on climatic and edaphic features, namely Fynbos, Renosterveld and Strandveld. The Succulent Karoo Biome is located in the more arid parts of the winter rainfall region occupying the northern sections of the West Coast region and the Little Karoo in the rain shadow basin between the Swartberg and Outeniqua/Langeberg Mountains. The Nama Karoo Biome occupies the arid north-eastern parts of the province which receive predominantly summer rainfall. The Albany Thicket Biome is more characteristic of the Eastern Cape, but extends into the Western Cape in areas where the Succulent and Nama Karoo become more mesic. The Afrotemperate Forest Biome occurs as naturally fragmented patches in the higher rainfall areas which are sheltered from frequent fire, more typically in the mountains, with the largest extents occurring in the Garden Route and Tsitsikamma, often extending onto the coast (Mucina & Rutherford 2006).

Box 2.1 **A snapshot of the Biomes of the Western Cape**

Fynbos Biome

The Fynbos Biome is a shrubland characterised by a dominance of fine-leaved, sclerophyllous shrubs, which is a characteristic shared by other Mediterranean Type Ecosystems (Fynbos meaning "fine bush" in Afrikaans). One of the characteristic features of Fynbos is that it is a fire-dependent ecosystem and the organisms that inhabit Fynbos are adapted to periodic fires e.g. serotiny, whereby plants only release their seeds after a fire. The Fynbos Biome can be further divided into three main vegetation complexes based on the soil substrate and rainfall, namely Fynbos, Renosterveld and Strandveld (Mucina & Rutherford 2006). The Fynbos Biome contains high levels of diversity and endemism, particularly plants, at various taxonomic levels. At the high taxonomic level of family, there are four plant families which are endemic to the Fynbos Biome, namely Geissolomataceae, Grubbiaceae, Roridulaceae and Penaeaceae (Manning 2007).

Fynbos

Fynbos typically occurs on nutrient-poor soils and floristically it is characterised by a prevalence of three plant families, namely Proteaceae, Ericaceae and Restionaceae. The other Fynbos vegetation types, namely Renosterveld and Strandveld can be characterised by a relative lack of these plant families.

The geology of the Cape Fold Mountains consists of hard quartzitic Table Mountain Sandstone which produces nutrient poor soils which support Fynbos. The Cape Fold Mountains are relatively well conserved, with the bulk of the protected areas of the Western Cape located in these mountains. The mountains are generally not well suited to productive land uses due to the steep slopes, inaccessibility and nutrient poor soils which has resulted in low levels of transformation.

Kogelberg Sandstone Fynbos (a well-protected vegetation type, however with the highest plant diversity of any vegetation type in South Africa) on the summits of the Kogelberg Mountains within the Kogelberg Nature Reserve, with *Mimetes hottentoticus* in the foreground (Image: Amida Johns).

Fynbos also occurs on the lowlands of the Western Cape in areas supporting more nutrient poor or leached soils, most commonly on acid sands and limestone, and is located on the coastal plain inland of the calcareous coastal sands of more recent origin.

The lowland Fynbos vegetation units have higher levels of transformation and in many areas are a focus of extensive current transformation. This includes urban expansion of the Cape Town metropolitan area (Rebelo *et al.* 2011), Garden Route towns and cultivation of the Sandveld in the northern parts of the West Coast due to the availability of irrigation which has permitted the expansion of various agricultural sectors such as potatoes and rooibos tea.

Leipoldtville Sand Fynbos occurring on the acid sands of the lowlands of the northern West Coast, commonly referred to as the Sandveld, which is under severe levels of transformation due to cultivation of mainly potatoes due to the expansion of irrigation pivots (Image: Rupert Koopman).

Renosterveld

Renosterveld occurs typically on nutrient-rich and less-leached shale and granite-derived soils on the lowlands of the coastal plain inland of the acid sand plains and also further inland of the Cape Fold Mountains where there is a transition to Nama and Succulent Karoo. Renosterveld is characterised by shrubland with a dominant component of microphyllous Asteraceae, including several characteristic dominant genera (*Dicerothamnus*, *Eriocephalus*). Grass and bulbous geophytes form a prominent component of many Renosterveld vegetation units.

A view of Renosterveld in the vicinity of Porterville. This is typical of an inland Renosterveld vegetation unit which is subject to landscape transformation through cultivation with only small remnant patches remaining. Clearly visible are the grass and bulbous geophytes that form a prominent component of many Renosterveld vegetation units (Image: Rupert Koopman).

The more nutrient rich soils of Renosterveld have resulted in a long history of cultivation within this vegetation type forming the base of the agricultural economy of the Western Cape, in particular grain, fruit and vineyards. As a result the highest levels of transformation in the province are found within Renosterveld, particularly the coastal plain Renosterveld vegetation units (Swartland and Overberg), with only small fragments remaining in areas which could not be ploughed e.g. steep slopes.

One of the more unique special habitats occurs at the interface between the clay soils of Renosterveld and the acid sands of the lowland sandplain Fynbos described above. Seasonal wetlands develop at the interface due to the differing permeability of the soil substrates, and as a result of the fluctuating water table, ferricrete (otherwise known as laterite or "koffieklip") forms in many places. These seasonal wetlands and ferricrete habitats contain high levels of endemics, and apart from the limited natural extent of this habitat, it is under high levels of threat particularly in the Cape Town metropolitan area and surroundings. Similarly naturally isolated deposits of silcrete has resulted in specific Renosterveld vegetation units adapted to silcrete which occur in a sea of agriculture in the Overberg and Swartland with very little remaining, albeit more rocky and saline for agriculture.

Strandveld

Strandveld is found along the coastline predominantly on marine derived calcareous sands. The vegetation type has been classified as within the Fynbos Biome however it displays a prominent Thicket component and a Succulent Karoo component in the more arid areas. Strandveld contains fewer microphyllous shrubs than the other Fynbos types in keeping with the more transitional nature of this vegetation type and does not burn frequently, if at all in certain cases. Although soils supporting Strandveld are not suitable for cultivation, due to its location adjacent to the coastline there are high levels of transformation in certain areas such as the urban expansion of the Cape Town Metropolitan Area, Garden Route towns and industrial development in Saldanha.

On the Saldanha Peninsula, Strandveld occurs not only on the calcareous coastal sands, but also on the granite and limestone substrates.

Saldanha Limestone Strandveld on a limestone ridge near to the coast on the Saldanha Peninsula. This vegetation type is characterized by shallow soils and is rich in endemic plant species. Cracks and pockets in the rock provide microhabitats which allow for specialist plants to colonise them. The Saldanha Peninsula is a major focus area for development within the province, including industry and mining, placing pressure on the restricted vegetation types occurring there (Image: Rupert Koopman).

Succulent Karoo Biome

The Succulent Karoo Biome is located in the more arid parts of the province which receives rainfall in winter, occurring directly north and west of the Fynbos Biome. This vegetation type is characterised by a prominence of succulent species, particularly from the families Aizoaceae (referred to as "mesems" or "vygies"), Crassulaceae, Euphorbiaceae and other leaf succulents in families not typically associated with succulent growth forms. The remainder of the vegetation consists of small microphyllous shrubs, with a prominent component of annuals and geophytes which appear in spring.

The Succulent Karoo is also a recognised global biodiversity hotspot reaching beyond the Western Cape, and is considered the most diverse arid region in the world (www.conservation.org). It occurs north of the Fynbos Biome along the West Coast with the quartz Knersvlakte plains north of Vanrhynsdorp and the hilly landscape of Namaqualand beyond that with the well-known spring wildflower displays on disturbed lands. Succulent Karoo also occurs in the Breede Valley between Worcester and Robertson and in the Little Karoo, broadly between the Langeberg and Outeniqua Mountains in the south and the Swartberg in the north. The Tanqua Karoo is very arid and occurs inland of the Cape Fold Mountains between Ceres and the Cederberg.

Although the Succulent Karoo is generally too arid for cultivation, overgrazing and intensive ostrich farming in the Little Karoo impact on this vegetation. Mining presents a significant threat to parts of the Succulent Karoo, which includes mineral resources that have not been exploited.

The Knersvlakte in the northern regions of the West Coast consists of flat plains dominated by quartz stones and supports a unique succulent flora adapted to this environment, such as highly succulent members of the Aizoaceae with the "stone plant" growth form.

White quartz gravel of the Knersvlakte. The Knersvlakte region is situated in the north-west corner of the Western Cape Province. Many succulents are confined to the white quartz gravel, which reflects the sunlight, and is not as hot as the darker rocks and soil. Many of the succulents here are usually dwarf and compact (such as the *Oophytum nanum* above); which represents an ideal proportion to absorb thermal heat for the short cool winter growing season when rain occurs. The Knersvlakte represents one of the richest succulent plant diversity centres and is also the southernmost distribution of the quiver tree (*Aloe dichotoma*) (Image: Rupert Koopman).

Nama Karoo Biome

The Nama Karoo Biome is located in the arid part of the province which is receiving rainfall predominantly in summer. The vegetation is characterised by a dominance of small microphyllous shrubs, particularly from the Asteraceae, and is lower in stature and with lower canopy cover than in Renosterveld. Grasses also form an important component, increasing towards the north-east. Plant and habitat diversity is lower in the Nama Karoo than in the Fynbos or Succulent Karoo Biomes, as the climate and geology displays relative homogeneity over a large area.

The Nama Karoo is important for several threatened faunal species, such as the riverine rabbit (*Bunolagus monticularis*) which is restricted to riparian habitats in the Karoo, although new localities extend its range into the Succulent Karoo. As with the Succulent Karoo, the Nama Karoo is too arid for cultivation but has been impacted through overgrazing practices. Although to date this Biome has not been subject to significant levels of transformation, there are significant threats to this Biome presented by mineral and petroleum resources that have not been exploited which could significantly change the current low levels of transformation.

Typical Nama Karoo landscape near Laingsburg with the escarpment rising from the plains in the distance. The vegetation is dominated by dwarf microphyllous shrubs with annual grasses forming an important component (Image: Colin Fordham).

Albany Thicket Biome

As stated above, the Albany Thicket Biome is more typical of the Eastern Cape and only extends marginally into the Western Cape in the Little Karoo and as valley thicket in the Gouritz and Mossel Bay regions. The Albany Thicket found within the Little Karoo is predominantly spekboomveld (*Portulacaria afra*). It occurs in more sheltered mesic parts of the Little Karoo and is highly susceptible to overbrowsing. Valley thicket occurs within the sheltered valleys in the eastern section of the coastal Renosterveld e.g. Gouritz River Valley.

An example of the Valley Thicket Mosaic within Renosterveld habitat, in which some open areas are located along the upper and more exposed slopes, where species typical of nearby Renosterveld is dominant (Image: Jan Vlok).

Afrotemperate Forest Biome

The Afrotemperate Forest Biome is naturally fragmented throughout Southern and Eastern Africa, predominantly on the mountain ranges where it occurs in areas sheltered from fire and with elevated rainfall due to orographic uplift. It is only in the Southern Cape, in the Garden Route, where Afrotemperate Forest extends onto the coastal plain and forms more extensive habitat. Afrotemperate Forest contains a typical forest structure with tall trees forming the canopy (e.g. yellowwoods *Podocarpus* spp.) and various strata. The levels of diversity are low compared to tropical rain forest, however it does have more diversity than the temperate forests of the Northern Hemisphere which are often dominated by one or two tree species. Fire dynamics play an important role in determining the extent of the forest, whereby the forest often expands its range into the mountain Fynbos in areas of fire exclusion e.g. Newlands Forest.

Afrotemperate Forest at the Witfontein Forest near George, with a closed canopy tree cover and a relatively sparse shade tolerant undergrowth (Image: Colin Fordham).

TABLE 2.1: Percentages of Biomes based on Mucina and Rutherford (2006) found in SA and the Western Cape with percentages conserved by the different Western Cape Conservation Categories in the Western Cape (Le Roux *et al*. 2012)

Biome	Total ha in SA	% of Biome in Western Cape	% of Biome protected in WCCC1 areas		% of Biome protected in WCCC2 areas		% of Biome protected in WCCC3 areas	
			2007	2012	2007	2012	2007	2012
Albany Thicket Biome	3 162 121	5	0.4	0.4	0.1	0.1	0.3	0.5
Desert Biome	737 038	0	0.0	0.0	0.0	0.0	0.0	0.0
Forest Biome	107 002	47	27	25	0.5	0.5	0.4	0.7
Fynbos Biome	8 525 176	79	9.4	9.7	8.0	7.8	8.5	10.2
Grassland Biome	36 431 847	0.03	0.0	0.0	0.0	0.0	0.0	0.0
Indian Ocean Coastal Belt	1 694 812	0	0.0	0.0	0.0	0.0	0.0	0.0
Nama-Karoo Biome	26 033 064	11	0.3	0.3	0.0	0.0	0.5	0.5
Savanna Biome	42 322 529	0	0.0	0.0	0.0	0.0	0.0	0.0
Succulent Karoo Biome	8 700 652	35	1.0	2.0	0.4	0.5	1.1	1.3

2.2.2 Vegetation Types and Threatened Ecosystems

Biomes are classifications of habitat at a broad global scale. Habitat can be further divided into vegetation types at a finer scale, which is possible in South Africa because of the recently updated national map of 435 vegetation units, mapped at a national scale at 1: 250 000 (Mucina & Rutherford 2006; SANBI 2012). Vegetation types provide a good representation of terrestrial biodiversity because most mammals, birds, insects and other organisms are associated with particular vegetation types or units (Jonas *et al*. 2012). For this reason, vegetation units are used as surrogates for ecosystems in the development of systematic biodiversity plans such as the WCBSP. See Box 2.2 for information on the use of vegetation types, vegetation units and threatened ecosystems.

There are 163 vegetation units recognised in the Western Cape; of these, 104 (64%) are endemic to the province and a further 19 (12%) are near endemic. Eighteen endemic or near endemic vegetation units have no area under formal protection (Le Roux *et al.* 2012).

A summary list of threatened vegetation types, or ecosystems in the Western Cape, is provided below and represented spatially on maps indicating both original extent (Figure 2.1) and remaining extent (Figure 2.2). Ecosystem threat status is indicative of the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition – on which their ability to provide ecosystem services ultimately depends. Ecosystems are categorized as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of the ecosystem that remains in good ecological condition relative to a series of thresholds, as well as several other criteria.

National figures supporting the list of threatened ecosystems published in 2011 under NEM:BA are based on land cover datasets primarily derived from satellite imagery taken in 1994–95 or 2000–2001[6]. This means that, in some instances, current national ecosystem threat status is based on conditions from 20 years ago.

6 The South African National Land-Cover Dataset 1994 (NLC 1994; Fairbanks *et al*. 2000) and the South African National Land-Cover Dataset 2000 (NLC 2000; Van den Berg *et al*. 2008), respectively.

In the Western Cape State of Biodiversity Report of 2012 (Turner 2012), there are 21 Critically Endangered ecosystems in the province of which ten have no official protection status. Nine of these have 10% or less natural vegetation remaining and they have no secure protection, namely Lourensford Alluvium Fynbos (3.86%), Central Rûens Shale Renosterveld (4.36%), Cape Flats Sand Fynbos (4.45%), Swartland Shale Renosterveld (6.33%), Swartland Silcrete Renosterveld (6.50%), Western Rûens Shale Renosterveld (6.67%), Ruens Silcrete Renosterveld (9.08%), Knysna Sand Fynbos (9.62%), and Peninsula Shale Renosterveld (10%). These nine units need urgent conservation attention. Of the 18 Endangered ecosystems, six have no protection and nine of the 25 ecosystems classified as Vulnerable have no protection.

In an effort to utilise best available science (including new land cover and vegetation maps) and to generate figures which more accurately reflect the current degree of habitat loss in the Western Cape, CapeNature assessed provincial ecosystem threat status in 2016 in accordance with national principles and approaches,[7] for criterion A1 (habitat loss).

The 2016 assessment undertaken by CapeNature found that no fewer than 14 vegetation units have moved into a higher threat category since the 2011 assessment and listing. Six units have moved from Least Threatened to Vulnerable, five from Vulnerable to Endangered, two from Endangered to Critically Endangered (Garden Route Granite Fynbos and Kouebokkeveld Alluvium Fynbos), and one vegetation unit moved from Vulnerable to Critically Endangered (Piketberg Quartz Succulent Shrubland). The extent of habitat loss across the province is concerning. The Western Cape now has 24 vegetation units that qualify as Critically Endangered, and a total of 67 qualifying as threatened. Therefore, CapeNature's 2016 ecosystem status results should be considered as best available science in all land use planning and decision-making; and specifically, they should be considered a lead informant when assessing significance ratings of development applications (until such time as an updated conservation plan is released).

Box 2.2 **On the use of vegetation types, vegetation units and threatened ecosystems**

Vegetation types are mapped at a scale smaller than a Biome, based on vegetation and landscape features, geology and soils, climate, and important taxa. The Western Cape comprises five Biomes that are divided into broad vegetation types.

As a subdivision to vegetation types, Mucina and Rutherford (2006) has divided the country into 435 **vegetation units.** These are defined as 'a complex of plant communities ecologically and historically occupying habitat complexes at the landscape scale'. Vegetation units share general ecological properties such as position on major ecological gradients and nutrient levels, and appear similar in vegetation structure and composition. There are 163 vegetation units recognised in the Western Cape.

Threatened ecosystems are listed in the NEM:BA, and include 67 in the Western Cape. The officially listed threatened ecosystems are identical to vegetation units.

The WCBSP prefers the use of vegetation units in terms of general vegetation descriptions. However, where reference is made to the national lists, the term threatened ecosystems is used.

7 Government Gazette 34809, No. 1002. National list of ecosystems that are threatened and in need of protection. National Environmental Management: Biodiversity Act, 9 December 2011.

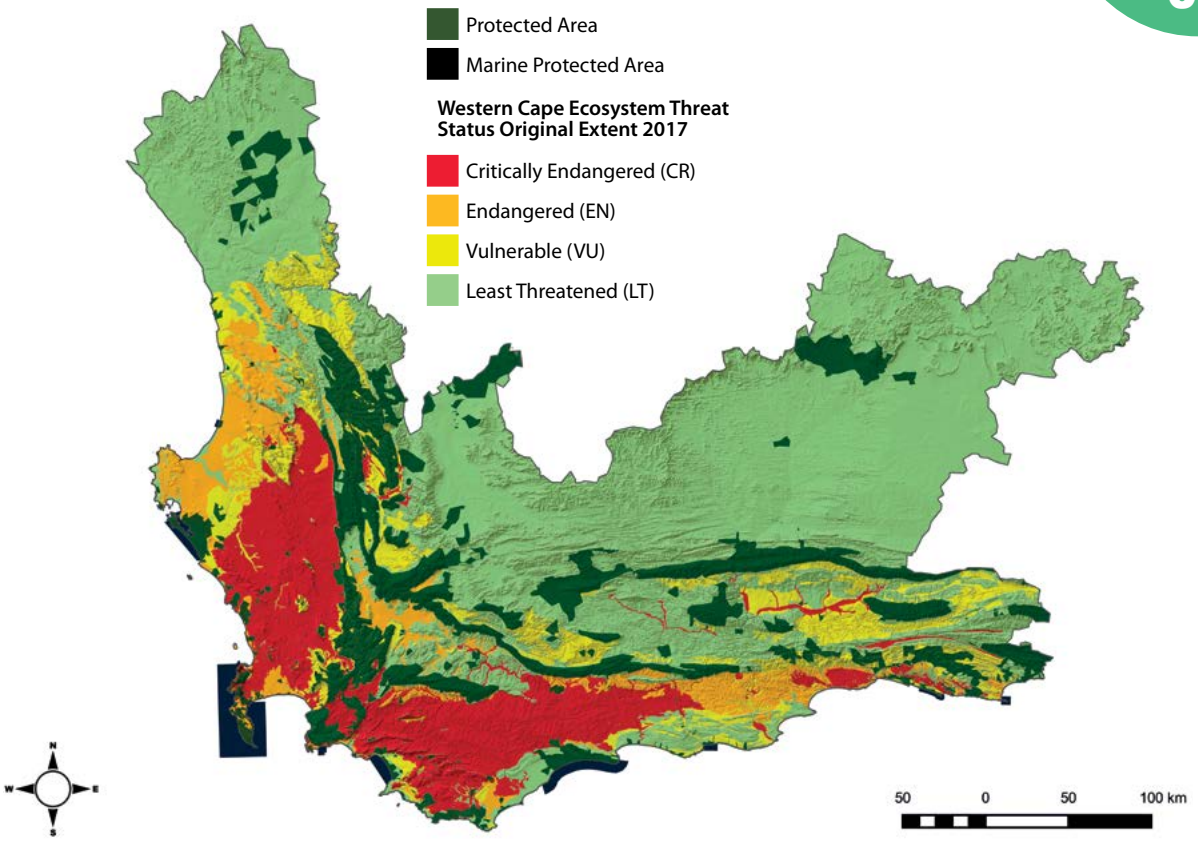

FIGURE 2.1: Map of Ecosystem Threat Status for the Western Cape, applied to the original extent of ecosystems as delineated in the SA Vegetation Map 2012 and according to CapeNature's 2016 assessment of threat status

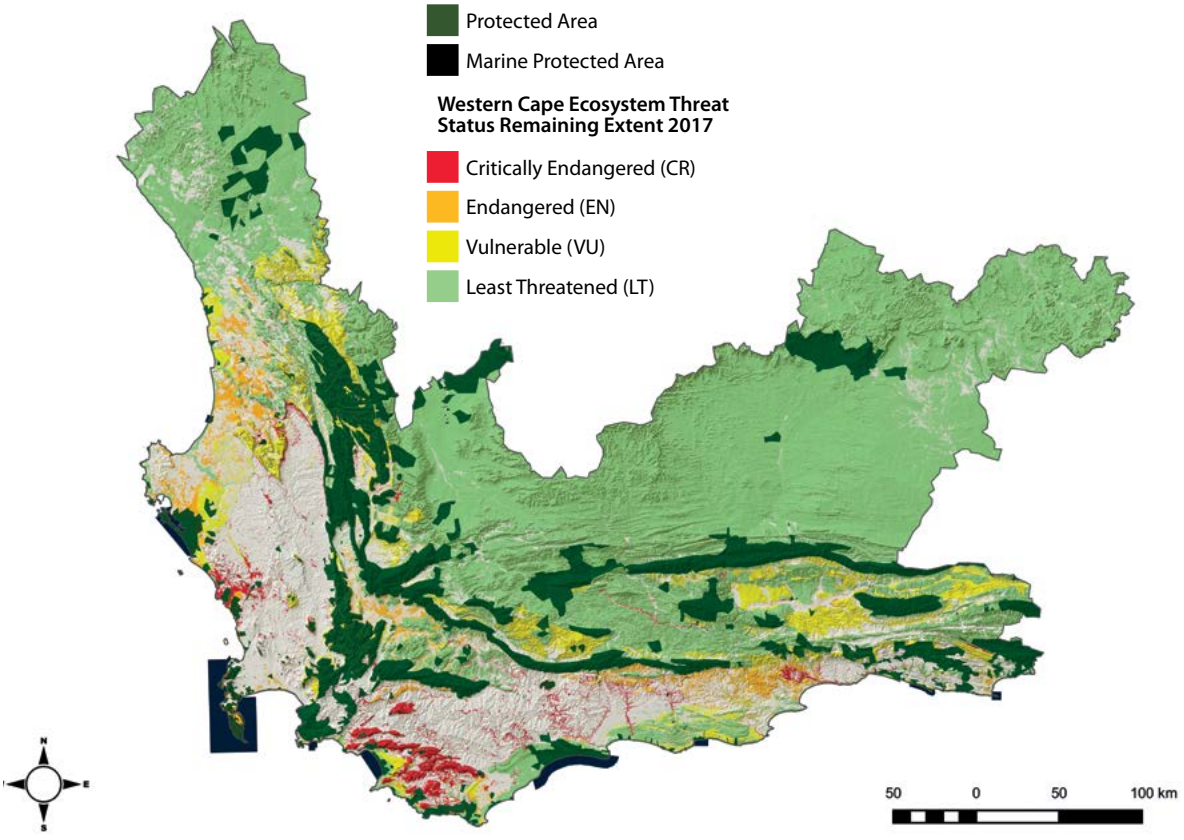

FIGURE 2.2: Map of Ecosystem Threat Status for the Western Cape, applied to the remaining extent of ecosystems as delineated in the SA Vegetation Map 2012 and according to CapeNature's 2016 assessment of threat status

Below is a summary of the threatened ecosystems of the Western Cape (Table 2.2). The reported threat status reflects the highest threat category achieved, either in terms of the 2011 national listing, or as per CapeNature's 2016 assessment of threat status, which focused exclusively on current levels of habitat loss (criterion A1).

Thus, the criteria relevant to the list below are as follows:

- A1: Irreversible loss of natural habitat;
- C: Limited extent & imminent threat;
- D1: Threatened plant species associations.

TABLE 2.2: Threatened Ecosystems of the Western Cape, 2016

Critically Endangered	Biome	Criteria
Atlantis Sand Fynbos	Fynbos	D1
Cape Flats Sand Fynbos	Fynbos	A1 & D1
Cape Lowland Alluvial Vegetation	Azonal	A1
Central Rûens Shale Renosterveld	Fynbos	A1
Eastern Rûens Shale Renosterveld	Fynbos	A1
Elgin Shale Fynbos	Fynbos	A1
Elim Ferricrete Fynbos	Fynbos	A1
Garden Route Granite Fynbos	Fynbos	A1
Knysna Sand Fynbos	Fynbos	A1
Kogelberg Sandstone Fynbos	Fynbos	D1
Kouebokkeveld Alluvium Fynbos	Fynbos	A1
Langkloof Shale Renosterveld	Fynbos	A1
Lourensford Alluvium Fynbos	Fynbos	A1
Muscadel Riviere	Azonal	A1
Overberg Sandstone Fynbos	Fynbos	D1
Peninsula Granite Fynbos	Fynbos	A1
Peninsula Shale Renosterveld	Fynbos	A1
Piketberg Quartz Succulent Shrubland	Succulent Karoo	A1
Rûens Silcrete Renosterveld	Fynbos	A1
Swartland Alluvium Fynbos	Fynbos	A1
Swartland Granite Renosterveld	Fynbos	A1 & D1
Swartland Shale Renosterveld	Fynbos	A1 & D1
Swartland Silcrete Renosterveld	Fynbos	A1
Western Rûens Shale Renosterveld	Fynbos	A1
Count:	**24**	
Endangered	**Biome**	**Criteria**
Agulhas Sand Fynbos	Fynbos	A1
Breede Alluvium Fynbos	Fynbos	A1
Breede Alluvium Renosterveld	Fynbos	A1
Cape Flats Dune Strandveld	Fynbos	A1 & D1
Cape Vernal Pools	Azonal	A1

Citrusdal Shale Renosterveld	Fynbos	A1
Garden Route Shale Fynbos	Fynbos	A1
Greyton Shale Fynbos	Fynbos	A1
Groot Brak Dune Strandveld	Fynbos	A1
Hangklip Sand Fynbos	Fynbos	A1
Leipoldville Sand Fynbos	Fynbos	A1
Mossel Bay Shale Renosterveld	Fynbos	A1
Peninsula Sandstone Fynbos	Fynbos	D1
Potberg Ferricrete Fynbos	Fynbos	A1
Saldanha Flats Strandveld	Fynbos	A1
Saldanha Granite Strandveld	Fynbos	A1
Swellendam Silcrete Fynbos	Fynbos	A1
Western Cape Milkwood Forest	Forest	C
Count:	**18**	
Vulnerable	**Biome**	**Criteria**
Agulhas Limestone Fynbos	Fynbos	D1
Albertinia Sand Fynbos	Fynbos	A1
Bokkeveld Sandstone Fynbos	Fynbos	D1
Boland Granite Fynbos	Fynbos	A1 & D1
Breede Sand Fynbos	Fynbos	A1
Cape Winelands Shale Fynbos	Fynbos	A1
Cederberg Sandstone Fynbos	Fynbos	D1
Ceres Shale Renosterveld	Fynbos	A1
Eastern Coastal Shale Band Vegetation	Fynbos	A1
Eastern Little Karoo	Succulent Karoo	A1
Hawequas Sandstone Fynbos	Fynbos	D1
Hopefield Sand Fynbos	Fynbos	A1 & D1
Kango Limestone Renosterveld	Fynbos	A1
Klawer Sandy Shrubland	Succulent Karoo	A1
Kouebokkeveld Shale Fynbos	Fynbos	A1
Lambert's Bay Strandveld	Fynbos	A1
Montagu Shale Renosterveld	Fynbos	A1
Nardouw Sandstone Fynbos	Fynbos	A1
Peninsula Shale Fynbos	Fynbos	A1
Piketberg Sandstone Fynbos	Fynbos	D1
South Outeniqua Sandstone Fynbos	Fynbos	A1
Southern Cape Dune Fynbos	Fynbos	A1
Southern Cape Valley Thicket	Fynbos	A1
Swartland Alluvium Renosterveld	Fynbos	A1
Uniondale Shale Renosterveld	Fynbos	A1
Count:	**25**	

2.3 Vegetation Variants

In addition to the National Spatial Biodiversity Assessment's vegetation units, vegetation variants were used in the compilation of the WCBSP Map. The vegetation variants arose from the C.A.P.E. Fine Scale Planning project for specified planning domains (refer to Section 1.2.3). Within the Fine Scale Planning project a study was undertaken for each planning domain to produce a defensible vegetation classification system and vegetation map which would form an integral part of the conservation assessment of the area by representing the original natural extent of different vegetation types, prior to any modern transformation. The approach was essentially one of verifying, through extensive ground-truthing and the use of supporting data such as geology maps and species locality records, the Vegetation Map of South Africa (Mucina & Rutherford 2006). Of primary importance was adjusting boundaries to be reasonably accurate at a scale of 1:10 000 (and highly accurate at 1:50 000) and adding new vegetation types where deemed necessary. In general, the national vegetation types were accepted as adequate, although new types were added when the unit was significantly different (structurally, floristically, and/or edaphically) from anything currently described in the Vegetation Map of South Africa. The boundaries of the national units, however, were substantially incorrect in many areas and therefore redrawn (Pence 2008).

Unfortunately, due to time and budget constraints, the study areas were often smaller than the full extent of the planning domains, focusing on the threatened lowland portions. Therefore it was necessary to augment the fine-scale vegetation map products with the Vegetation Map of South Africa to produce a continuous layer of vegetation types. This required that all fine-scale vegetation types be cross-referenced to national vegetation types, and all boundaries edge-matched. The final vegetation layer was enhanced with data from several other sources as well – always retaining the more accurate of the boundaries (i.e. those mapped at a finer scale), edge-matching, and cross-referencing each unit with the most similar national type. These additional sources of vegetation type units included: West Coast dune systems as mapped by Barrie Low, fine-scale wetlands for Saldanha and Sandveld as mapped by the Freshwater Consulting Group, and vegetation types at the Fynbos/ Succulent Karoo interface (in the Bokkeveld) as mapped by the Conservation Farming Project.

For the Little Karoo, Garden Route and Riversdale Coastal Plain planning domains the vegetation categories were not based on the South African vegetation types of Mucina and Rutherford (2006), but rather a hierarchal classification system consisting of 7 tiers (see Box 2.3 for detail): ecosystem, Biome, habitat, region, sector, unit and variant (Vlok *et al.* 2005, 2008; Vlok & De Villiers 2007). Mapping was done at a 1:30 000 scale. The three maps (Little Karoo, Garden Route and Riversdale coastal plain) have been stitched together into a single map (Vlok_ veg_map_combined_2014 – available from CapeNature). This map has multiple uses. Apart from the valuable use of the map at the fine-scale variant level to inform biodiversity decision-making (e.g. proposed land use changes, stewardship sites, corridor networks, protected area expansion plans, etc.), it can also be used at other levels. For the Little Karoo, potential ecosystem services maps have been produced, such as potential forage production, potential carbon storage, and potential erosion control (Reyers *et al.* 2009). Other maps that have been developed to inform decision-making are fire management maps, game stocking maps, veld restoration potential maps and ostrich maps (Forsyth *et al.* 2008). An aquatic systems map can easily be generated showing perennial streams, rivers and floodplains, wetlands, pans, estuaries, etc. which is of great value to water resource management. Similarly, multiple other maps can be generated to inform decision-making.

Sufficient data were not provided to integrate the Riversdale Coastal Plain Fine-Scale Vegetation Map with the Vegetation Map of South Africa; as a result both products (and therefore sets of vegetation types) were used in the conservation assessment.

Box 2.3 **Detail of hierarchical vegetation classification system**

Seven tiers:

The **first tier** splits into aquatic versus terrestrial ecosystems. The **second tier** splits the aquatic systems into those that drain fresh versus brack water, and the terrestrial systems at the Biome level (including the marine Biome to incorporate the units that are directly associated with the marine environment). The **third tier** divides the units into habitat types based on the structural characteristics of the vegetation present within the Biome. The **fourth tier** subdivides the habitat types into regions that differ in their floristic component, focussing on differences in the dominant species present and/or changes in regional endemic species; these are thus regional biogeographic zones. At the **fifth tier** the habitat types are divided into sectors that differ in their floristic component, either in the dominant species or in local endemic species present. At the **sixth tier** it is indicated if the terrestrial vegetation unit consists of solid units with elements of only one Biome present or if elements typical of more than one Biome are present (so called 'mosaic vegetation units'). The **seventh tier** is the variant, which is the finest level and a combination of habitat type and sector. A description of each of the variants is provided indicating prominent species, and if known any rare, localised or endemic species.

2.4 Freshwater Ecosystems

The freshwater ecosystems of the Western Cape consist of watercourses and wetlands, and form an important basis for the ecological infrastructure of the province, as water resources are key to the socio-economic development of the Western Cape, particularly since it is a relatively water-scarce area and it is a major limitation on further growth (refer to Section 2.7.1 for more information regarding water resources and development and Section 3.2.3 for information on the spatial data related to wetlands and watercourses).

2.4.1 Wetlands and Watercourses

The Western Cape houses more than 300 000 ha of recently mapped wetlands and several river catchments (including seven major catchments within two water management areas). These major catchments also contain six of the country's strategic water resource areas. Wetlands comprise only 1% of the land cover of the province. According to the results of the National Freshwater Priority Areas Project (NFEPA; Nel & Driver 2012) wetland data, only 13% of wetlands in the Western Cape are still intact, with a further 34% being moderately modified and the remaining 53% found to be heavily to critically modified.

The wetland types found in the Western Cape are known to be extremely diverse with their properties being driven by varying hydrological patterns, soil structure and seasonality of precipitation (Gouws *et al.* 2012). These wetlands perform a variety of important ecosystem services, particularly with regard to flood attenuation (Figure 2.3), water purification, drought management and biodiversity conservation. The latter point in particular is linked to the high diversity and high degree of endemism found within the fauna, flora and ecosystems associated with the Fynbos Biome in general.

FIGURE 2.3: An example of river bank erosion along the Huis River, as a result of a lack of natural riparian vegetation and encroachment of alien invasive plants (Image: Martine Jordaan)

In light of the above, it is clear that it would be difficult to group the wetlands of the Western Cape into a single category. However, the diverse range of wetlands types, classified according to their hydrogeomorphic units, include seepage areas in the upper mountain catchments (hillslope and valleyhead seeps), to valley-bottoms (both unchannelled and channelled), pans (depressions and benches), and the floodplain wetlands leading down into the estuaries at the coast (see Box 2.4). Several wetlands located within these catchments are considered important, including the six Western Cape Ramsar sites (Ramsar List of Wetlands of International Importance in terms of the Convention on Wetlands, Ramsar, Iran 1972) listed below:

1. The **Wilderness Lakes** (designated in 1991) are located in the southeast of the Western Cape, in the Breede-Gouritz Water Management Area. The lakes form a chain of permanent, interlinked coastal lakes, which is connected to the ocean (Bo-Langvlei, Langvlei, Rondevlei, Swartvlei and Groenvlei). The habitat surrounding the lakes includes dunes, thickets, some woodland, marshes and reedbeds, and is mostly protected within the Garden Route National Park. It should be noted that this Ramsar site together with Swartvlei are the only warm temperate lake systems which are connected to the ocean.
2. Both the **De Mond (Heuningnes Estuary)** and the De Hoop Vlei are located on the Agulhas Plain and managed within CapeNature Provincial Nature Reserves. This area also contains South Africa's second largest coastal lake, Soetendalsvlei. De Mond has been a Ramsar site since 1986 and provides important habitat for wintering, staging and feeding areas for many breeding bird species, including migrants and waterbirds as well as several species from other taxa.
3. **De Hoop Vlei** has been a Ramsar site since 1975 and it also provides important habitat for wintering and staging waterbird species. Both of these systems are surrounded by agricultural lands and siltation and runoff caused by the activities upstream are major impacts on the integrity of the estuarine and wetland ecosystem function.

4. The most recently designated Ramsar site is found within the **False Bay Nature Reserve** (since 2015), which is located in the Cape Flats. Permanent wetlands in this area comprise about 50% of the land cover and it supports at least two critically endangered vegetation units (Cape Flats Sand Fynbos and Cape Flats Dune Strandveld). The area includes two lakes, namely Rondevlei (protected) and Zeekoevlei (surrounded by residential development). Both vleis provide habitat for many species of waterbirds (e.g. flamingos), mammals (e.g. hippopotamus (reintroduced), cape clawless otter) and plants. The area also offers space for recreation activities such as fishing, water sports and picnics.
5. There are two Ramsar sites located along the West Coast. The first of which is the **Langebaan** lagoon, which was designated in 1988 and includes Schaapen, Marcus, Malgas and Jutten Islands. The lagoon provides a marine habitat which includes reedbeds, sandflats, islands, dwarf shrubland and saltmarshes. The lagoon provides important nursing habitat for numerous fish species and is also important for wintering and staging waterbirds. This Ramsar site is a marine ecosystem and therefore technically falls under Section 2.5. There is however a minor freshwater influence at the head of the lagoon where there is groundwater inflow, as evidence by the *Phragmites* reedbeds in this location.
6. The second Ramsar site along the West Coast is the **Verlorenvlei**, which was designated in 1991 (Figure 2.4). It is also one of the largest freshwater lakes of the country. It contains shrubland, dune systems, marshlands and reedbeds. It is an important feeding area for pelican species, habitat for fish species (particularly the Verlorenvlei redfin minnow *Pseudobarbus verloreni*) and staging bird species. Water is abstracted from the vlei for irrigation purposes and the buffer area is also used for cattle grazing. Due to upstream activities, siltation and nitrification of the water has become a major impact. This has also allowed for the proliferation and encroachment of the indigenous reed, *Phragmites australis*.

FIGURE 2.4: View of the upper section of the Verlorenvlei, a Ramsar site located along the West Coast which is impacted by surrounding agricultural land uses (Image: Kevin Shaw)

It should be noted that most of the Ramsar wetlands above do have an estuarine or marine influence (in particular Langebaan) and therefore are also of relevance to Section 2.5.

Box 2.4 **Wetland Types (Ollis *et al*. 2013)**

Seeps – Landscape setting: slopes. Include hillslope and valleyhead seep hydro-geomorphic units. These wetlands are often seasonal and are mostly fed by groundwater, hillslope interflow and to a lesser degree, precipitation. They are most numerous in the mountainous areas of the Western Cape. Seepages in the Western Cape Mountains support vegetation typical of the Fynbos Biome with numerous endemic taxa (e.g. Bruniaceae and several frog species), and can be considered of vital importance in terms of a steady water supply for the river catchments that supply water to the Western Cape.

Mid-slope example of the Perennial Stream habitat in the Langeberg, where taller shrubs such as *Berzelia* and often *Leucadendron salicifolium* are more prominent (Image: Jan Vlok).

Valley-bottom wetlands – Landscape setting: valley floor. Usually wetter for longer periods than seeps. These wetlands are mostly fed by overland inflow, hillslope interflow and groundwater. They may be channelled (with at least one or more clearly defined steam channels, but lacking floodplain features), or un-channelled (with no clearly defined stream channel). Dune slacks are a type of valley bottom wetland, with examples of these occurring on the Cape Flats which are under pressure from urban development.

Floodplain wetlands – Landscape setting: plain. Gently sloped, with floodplain features and a distinct stream channel. They are usually associated with a river (e.g. Lower Berg River floodplain).

Depressions and flats/benches (pans) – Landscape setting: bench or flat. Areas that accumulate surface water, either in depressions, or extensive areas characterised by level, gently undulating or uniformly sloping land; pans are shallow, seasonal or permanent bodies of water that are not directly connected to river systems by surface flow.

Inland open waterbodies. These include the natural freshwater lakes such as Soetendalsvlei. They are permanently inundated natural lentic aquatic ecosystems. Dams are artificial impoundments. These systems are considered wetlands in the Ramsar definition of a wetland, but they are not considered wetlands in the National Water Act (1998) definition.

2.4.2 Rivers

As a result of the semi-arid nature of the country and increased water demand linked to population growth and increased development, the water resources in the Western Cape are under serious threat. These resources include the rivers, many of which originate in the mountain catchments, often associated with seeps and other wetland types, contributed to by smaller tributaries and flowing down through the foothills to the lowlands and plains and ultimately into the sea via an estuary. Some of these river catchments are highly productive with regards to water provision, i.e. high water yield. In fact, a total of seven important water source areas have been identified and mapped for the Western Cape, including Grootwinterhoek, Table Mountain, the Boland Mountains, the Langeberg Mountains, the Swartberg Mountains, the Kougaberg Mountains and the Outeniqua Mountains (Nel *et al.* 2011a; WWF-SA 2013).

The rivers of the Western Cape Province are housed within sections of 10 different ecoregions, namely the Drought corridor, Southern Folded Mountains, South-eastern coastal belt, Great Karoo, Southern coastal belt, Western Folded Mountains, South-western coastal belt, Western coastal belt, Nama Karoo, and Namaqua highlands (Kleynhans *et al.* 2005; Nel *et al.* 2011a, 2011b). Due to this regional variation, it is not surprising that the rivers of the Western Cape Province form important habitats for various indigenous fish and other aquatic fauna endemic to the region [see De Moor & Day (2013) for further details for invertebrates].

There are several impacts and pressures that threaten the viability and health of river ecosystems, mostly related to land use practices, the presence of invasive alien fauna and flora as well as water quality and over-use of water. It is because of these impacts that most of the province's main stem rivers, like the Breede, Berg, Olifants, Doring and Gouritz Rivers, are worse off than the tributaries feeding them (Nel & Driver 2012). In fact, as is the case for the rest of the country, it is the lowland and floodplain rivers that are under most threat, as they are the least protected in relation to the higher lying river ecosystems (Nel & Driver 2012). It is also the case that the tributaries that are free of alien invasive fish species are now the main refuges for the numerous endemic indigenous fish species of the Western Cape. In fact only 20% of the rivers mapped in the NFEPA project for the Western Cape were identified as FEPAs (Nel *et al.* 2011a), and of these, only 29% where identified to be indigenous fish sanctuaries.

2.4.3 Groundwater

Although groundwater systems themselves are not considered of major importance to biodiversity, groundwater plays an important role in terms of the interaction with surface water and associated ecosystems and hence is an important consideration in terms of land use and water resource management, as explained below.

Significant areas of groundwater-surface water discharge:

In areas indicated to have a high probability of groundwater-surface water interaction, groundwater plays a particularly important role in the ecological functioning of surface waters, maintaining river pools that serve as crucial refugia in the summer low flow months, sustaining river base flows, and maintaining wetlands and riparian vegetation. It is, therefore, particularly important to manage the groundwater resource in these areas. Management activities should include controlling, or preventing groundwater abstraction, maintaining natural vegetation cover, and clearing alien invasive plants.

Significant areas of groundwater recharge:
Groundwater recharge is dependent mainly on rainfall and geological permeability, and different areas will vary in their ability to recharge groundwater. Deleterious activities in areas that have significant recharge can have a keystone effect on the functioning of groundwater dependent ecosystems, which can be in the immediate vicinity, or far removed from the recharge area. Identifying areas of significant groundwater recharge allows for pro-active management of activities that may lower the groundwater quantity or quality in their vicinity. Such management activities would include controlling, or preventing, groundwater abstraction, maintaining natural vegetation cover, and clearing alien invasive plants.

Major threats and impacts: Although some of these estuaries are protected (e.g. the Langebaan Lagoon in the West Coast National Park) they are vulnerable to impacts of groundwater abstraction. This is particularly true of the Berg River estuary. Additional threats to the effective functioning of estuaries and groundwater resources include pollution, eutrophication, and failed recharge due to surface and groundwater extraction.

2.5 Coastal and Marine Environment

South African is well known for its rich marine biodiversity and diverse coastal environment. The Western Cape has a coastline of just over 1000 km, unfortunately, the coastline and marine biodiversity is threatened by several factors including increased fishing effort, coastal development, reduced freshwater flows into the marine environment, pollution, alien invasive species and climate change. The 2011 National Biodiversity Assessment (NBA) (Sink *et al.* 2012) found that fishing is the greatest threat to marine biodiversity, and coastal development is placing the greatest pressure on coastal biodiversity. The NBA also highlighted that South Africa's marine resources are over-exploited, several species are threatened and 47% of marine and costal habitat types are threatened. The promulgation of marine reserves or marine protected areas (MPAs) should be aimed at protecting and replenishing vulnerable marine biodiversity and coastal habitat (Figure 2.5).

South Africa has three major marine biogeographic zones: (a) the cool temperate West Coast; (b) the warm temperate South Coast; and (c) the sub-tropical East Coast (Stephenson & Stephenson 1972; Attwood *et al.* 1997). Further to this, South Africa has five major marine ecotypes that need protection, namely rocky shores, sandy shores, offshore reefs, offshore soft sediment, and estuaries. The maintenance of undisturbed ecosystems requires that each habitat type (or ecotype) be represented in MPAs. The conservation of threatened species and the maintenance of fishery yield require that relevant species are included in sufficient MPAs to provide protection throughout their range (Attwood *et al.* 1997).

FIGURE 2.5: Typical example of the Primary Dune habitat along the Southern Cape coastline with characteristic species such as *Scaevola plumieri* and *Thinopyrum distichum* in the foreground (Image: Jan Vlok)

2.5.1 Marine Protected Areas

There are currently 23 coastal MPAs in South Africa which were promulgated under the Marine Living Resources Act (Act 18 of 1998). Of these 23, nine are situated within the Western Cape under the management of SANParks, CapeNature, or the City of Cape Town.

1. **West Coast National Park MPA** is under the management authority of SANParks (Figure 2.6). It comprises five smaller MPAs within the broader park network. These MPAs fall within the cool temperate West Coast biogeographic area. The five areas include exposed and sheltered sandy beaches and rocky shores, a lagoon, mud flats, salt marshes, subtidal reefs and sandy benthos. Malgas, Jutten and Marcus Islands support breeding colonies of several species of IUCN Red Data List seabirds, highlighting their importance to seabird conservation. The park includes the Langebaan Lagoon (also a Ramsar site, Section 2.4.1 refers), which is the only true lagoon system in South Africa. It supports a rich bird life and is a declared Ramsar Site. The lagoon also has a rich diversity of marine invertebrates, seaweeds and fish species.

FIGURE 2.6: Saldanha Bay and Langebaan Lagoon viewed from the summit of the Postberg Peninsula, which forms part of the West Coast National Park MPA, along with the islands in the bay (Image: Carmen Gagiano)

2. **Table Mountain National Park MPA**, also managed by SANParks, is located in the transition zone between the south-western Cape bioregion and the Agulhas bioregion. The MPA supports a rich diversity of marine species and is also a culturally significant area as it contains fish traps, numerous wrecks and traditional fishing communities.
3. The **Helderberg MPA** is a small, 4 km stretch of sandy shoreline between the Eerste River mouth and the Lourens River mouth. The MPA is managed by the City of Cape Town as a conservancy under the NEM:PAA.
4. **Betty's Bay MPA** is situated at the western end of the Agulhas bioregion. The MPA falls under the management jurisdiction of CapeNature and it forms part of the core zone of the UNESCO designated Kogelberg Biosphere Reserve. The MPA includes rocky shores, exposed sandy beaches, estuaries, subtidal reefs and kelp forests. Adjacent to the MPA is the Stony Point African penguin colony which supports a critically important growing, land-based population of African Penguins (*Spheniscus demersus*). The area is highly productive and supports a rich diversity of fish, invertebrate and algal species as well as two IUCN red listed species, the African Penguin and Bank Cormorant (*Phalacrocorax neglecta*). The MPA is important for the protection of abalone, west coast rock lobster and linefish species.
5. **De Hoop MPA**, also managed by CapeNature, includes rocky platforms, boulder bays, sandy beaches and subtidal rocky reefs and sandy benthos. The MPA supports a rich diversity of intertidal biota, protects reef fish, provides a refuge for several over-exploited fish species and is a critically important nursery area for the Southern Right Whale (*Eubalaena australis*) [annually, the MPA plays host to 70 – 80% of cow-calf pairs observed on the entire South African coast (Best & Scott 1993)]. The MPA is also an important breeding area for African black oystercatchers (*Haematopus moquini*).
6. The **Stilbaai MPA**, managed by CapeNature, is the first MPA to include an estuarine system into its borders. The Goukou estuary is a permanently open system and is highly productive, forming an important nursery area for coastal fishes. This MPA also features one of the remaining two functional stone-age fish traps (visvywers).
7. **Goukamma MPA,** managed by CapeNature, is situated in the Southern Cape and consists of rocky and sandy shores and a temporary open-closed estuary (Goukamma estuary). The MPA also supports a breeding population of African black oystercatchers and the offshore reefs are an important habitat for commercially exploited fish species.
8. The most easterly MPA managed by CapeNature is the **Robberg MPA**. This forms the boundary around the Robberg Nature Reserve peninsula. This MPA consists of 9.5 km coastline of rocky shores with two sandy beaches. The MPA includes subtidal reefs and sandy benthos. The MPA provides refugia for exploited reef fishes, a Cape fur seal colony and African black oystercatchers.

2.5.2 Estuaries

Estuaries are classified as a partially enclosed coastal body of water which is either permanently or periodically open to the sea and within which there is a measurable variation of salinity due to the mixture of sea water with fresh water derived from land drainage (Day 1980). South Africa is host to nearly 300 functional estuaries which fall into three regions, namely cool temperate, warm temperate and subtropical (Whitfield 1998). The Western Cape is host to 52 estuarine systems with the most westerly being the Olifants estuary on the west coast and the most easterly is the Bloukrans estuary which forms part of the Western and Eastern Cape provincial boundary.

Estuarine systems are not isolated systems as they form the interface between marine and freshwater systems. They form part of regional, national and global ecosystems either directly via waterflows or indirectly through the movement of fauna. In addition to the biota that these estuaries support, they provide a range of goods and services to the inhabitants of the various regions. Estuaries are well known for their biodiversity, productive fish and invertebrate fisheries and for the important functions that they perform. These functions include providing nursery areas for marine fish, conduits for species which move between oceans and rivers, and feeding and staging sites for significant populations of migratory birds (Turpie *et al.* 2002).

The 2011 NBA (Van Niekerk & Turpie 2012) determined that about 43% of estuary types are threatened, representing 79% of South Africa's estuarine area, while 59% of South Africa's estuarine ecosystem types are not protected. The most significant threats to estuarine biodiversity are flow reduction, habitat modification, fishing and pollution, all of which are cumulative pressures on estuarine systems (Van Niekerk & Turpie 2012). The protection of estuaries is still regarded as inadequate as some protected estuaries are small and insignificant (fall within an existing protected area) or protection is incomplete, covering only part of the estuary (e.g. Keurbooms, Goukamma and Heuningnes estuary – Figure 2.7). The formation of estuary forums, in line with the National Estuarine Management Protocol, has taken strides in increasing protection of estuaries by means of co-operative governance.

FIGURE 2.7: The Heuningnes River Estuary located within De Mond Nature Reserve, managed by CapeNature, which is recognised as a Ramsar wetland of international importance (Image: Liesel Kershoff)

2.6 Species of Conservation Concern

Species of conservation concern are those that have particular ecological, economic or cultural importance and include: those that are rare, endemic or threatened; species with unusual distributions; and medicinal and other indigenous species that are exploited commercially or for traditional use. The Western Cape is home to approximately 1 709 plant species alone that are considered to be of conservation concern (Le Roux *et al.* 2012); these species are rare, endemic, threatened, declining or data-deficient, and are included in the Red Data List of South African plants (Figure 2.8). Figures for animal groups are less readily available, as the Red Lists for these groups of organisms are still in preparation. Table 2.3 provides a brief overview of species richness in various plant and animal groups, and notes on some of the species of conservation concern.

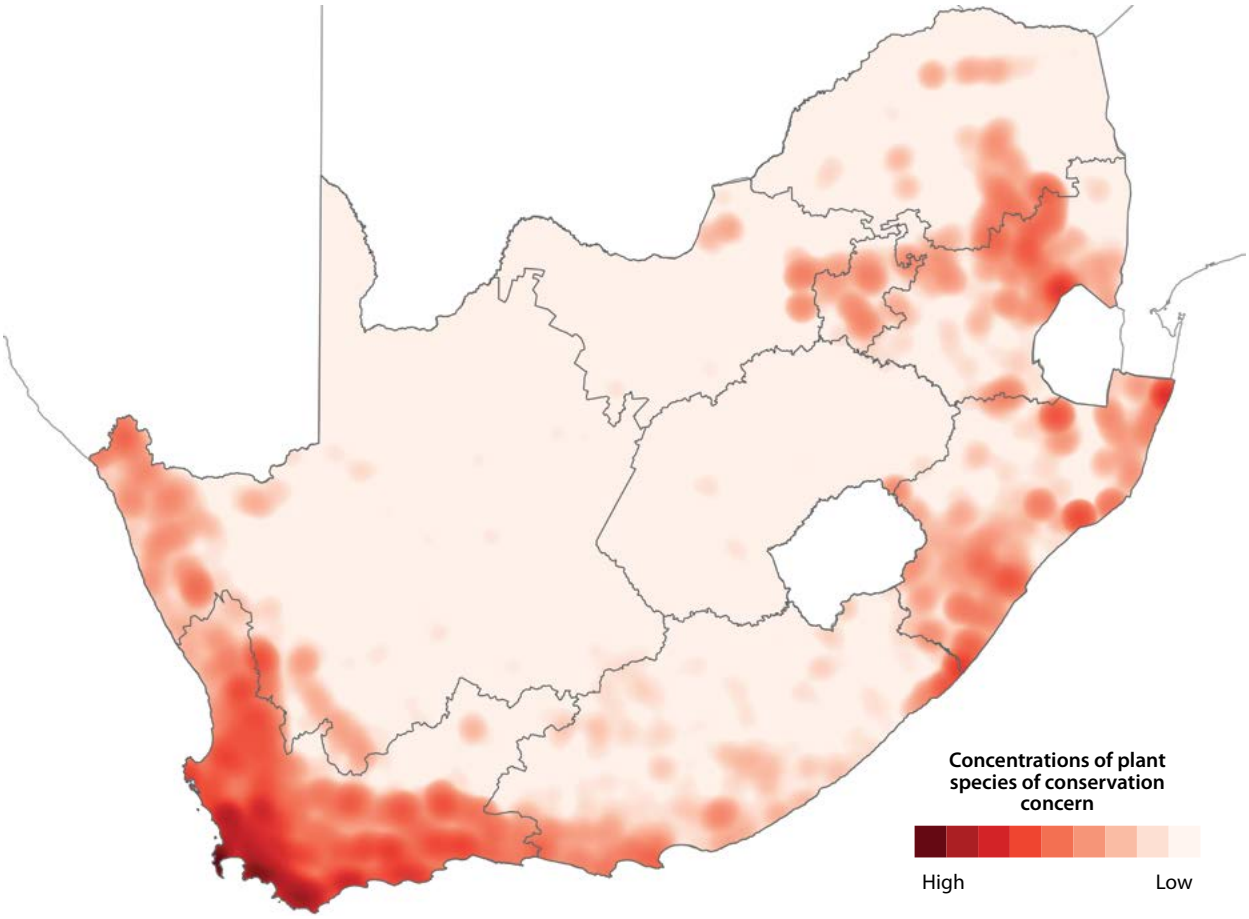

FIGURE 2.8: A map of South Africa, showing areas of high concentrations of taxa of conservation concern, indicating the large proportion of threatened species in the Western Cape, validating the global biodiversity hotspot status of the Cape Floristic Region and the Succulent Karoo (SANBI 2015)

***Protea odorata* (Swartland Protea) is one of the 619 Critically Endangered plant species within the Western Cape. This is species is at a very high risk of extinction, restricted to a single population of less than 30 individuals on a fragment of Renosterveld vegetation between Kraaifontein and Paarl. It is however not the only species in this predicament and can be considered indicative of the dilemma faced by several other species restricted to small fragments of vegetation (Image: Nigel Forshaw).**

TABLE 2.3: Notes on species of special conservation concern in the Western Cape

PLANTS: 13 489 species
There are 10 714 (SANBI 2015) plant taxa (species, subspecies and varieties) recorded for the Western Cape. This represents more than 52% (SANBI 2015) of the 24 008 taxa recorded for South Africa. Of the plant taxa in the Western Cape, 96% are indigenous and 4% are naturalised (originally from outside the Western Cape). Of the naturalised taxa, 2% of the Western Cape flora are invasive species. A large percentage of Western Cape flora is endemic to the province: 6655 (SANBI 2015) taxa or 51% of the species indigenous to the Western Cape (SANBI 2012). A large number of plant taxa in the Western Cape are listed as Threatened – 1865; 66% of South Africa's threatened plant species (SANBI 2015). Of these 290 are Critically Endangered, 619 Endangered and 877 are Vulnerable (SANBI 2015). There are 21 Extinct taxa and three are Extinct in the Wild and 37 Critically Endangered, Presumed Extinct. This last category, CR PE, is a fluid one because every field season seems to yield a re-discovery or two, e.g. *Moraea loubseri,* a Critically Endangered species thought to be extinct, was re-discovered in September 2011. Of the 1865 threatened taxa, 1768 are endemic to the Western Cape (SANBI 2015).

In total there are 3332 (SANBI 2015) plant taxa of Conservation Concern (broader than only threatened species) in the Western Cape. Of these, 3079 are endemic to the Western Cape.

The Fynbos and Succulent Karoo Biomes are both recognised as global biodiversity hotspots and contain the majority of the threatened plant species in the province with 1839 and 364 threatened taxa respectively. The highest concentration of threatened plant species are within the lowlands of the Fynbos Biome (including Fynbos, Renosterveld and Strandveld) where there are existing high levels of transformation and are continuing to disappear at a rapid rate (as described in Section 2.2). Many species are at risk of extinction and require targeted action to prevent extinction within the near future. In terms of the broader categories that are included within the Species of Conservation Concern but not Threatened Species categories (e.g. Critically Rare), many of these would occur in the mountains where they may be well protected but highly restricted in distribution and hence vulnerable.

MAMMALS: approximately 172 species

The Western Cape has 172 described mammal taxa (species and subspecies). Of these, 19 are listed as Threatened in the South African Red Data Book, based on regional assessments. Three are Critically Endangered, four are Endangered, 10 are Vulnerable and 18 are Near Threatened. Seven of eight taxa are extant and endemic to the Western Cape while nine are near endemic and some taxa are considered locally Extinct in the Wild. The world-renowned plant diversity and diversity of vegetation communities of the Western Cape provides a diverse landscape and a variety of habitats and ecotones for which evidence suggests an associated level of speciation in other taxa, including mammals.

Recent analysis of IUCN Red List data highlighted invasive alien species as the third most severe threat to birds and mammals. Together with climate change, they have become one of the most difficult threats to reverse. Even though the current estimate of threatened mammal species in the Western Cape (11%) is low when compared to the global percentage (22%) or the national percentage (18%), the impact of loss of populations/ ecotypes/potential evolutionary significant units, should not be under-estimated.

Species endemic to the Western Cape

Acomys subspinosus	Cape spiny mouse
Amblysomus corriae devilliersii	Fynbos golden mole (West)
Bathyergus suillus	Cape dune molerat
Cryptochloris zyli	Van Zyl's golden mole
Damaliscus pygargus pygargus	Bontebok
Dasymys capensis	Cape water rat
Hippotragus leucophaeus	Blue antelope (extinct)
Myosorex longicaudatus boosmani	Boosmansbos long-tailed forest shrew
Tatera afra	Cape gerbil

Species near endemic to the Western Cape

Amblysomus corriae corriae	Fynbos golden mole (East)
Bunolagus monticularis	Riverine rabbit
Chlorotalpa duthieae	Duthie's golden mole
Chrysochloris asiatica	Cape golden mole
Equus zebra zebra	Cape Mountain zebra
Eremitalpa granti granti	Grant's golden mole
Georychus capensis	Cape molerat
Myomyscus verreauxi	Verreaux's mouse
Myosorex longicaudatus longicaudatus	Knysna long-tailed forest shrew
Raphicerus melanotis	Cape grysbok

Riverine Rabbit *(Bunolagus monticularis)* is listed as Critically Endangered. Although not endemic to the Western Cape, it is endemic to the Karoo region, being restricted to the alluvial vegetation along watercourses. As described above, the Nama Karoo has not been subjected to high levels of transformation, however this region is currently facing several potential threats which may impact this species (Image: Andrew Duthie).

Cape Vulture (*Gyps coprotheres*) is listed as Vulnerable and occurs in a single colony in the Western Cape on the cliffs of Potberg in De Hoop Nature Reserve and forms an isolated population a long distance from the next nearest colony. This is the only colony in South Africa that is showing an increasing trend as the species is facing threats from the muthi trade, poisoning of carcasses and energy infrastructure (wind farms and powerlines) amongst other threats (Image: Kevin Shaw).

BIRDS; approximately 600 species

An estimated 600 bird species have been recorded in the Western Cape Province of which about 48% are resident. The rest are either birds that migrate south during summer (11%), pelagic species occurring off the shores of the province (9%), established exotics (2%) or vagrant species (30%). Of the bird species, 93 are listed as threatened (with six regionally extinct) in the 2015 South African Red Data book of Birds and include the Critically Endangered Damara Tern (*Sterna balaenarum*) that breeds at a limited number of localities along the coastline (e.g. De Mond Nature Reserve) and Endangered species such as the Hottentot Buttonquail (*Turnix hottentottus*), African Marsh Harrier (*Circus ranivorus*), Black Harrier (*Circus maurus*) and the Ludwig's Bustard (*Neotis ludwigii*). The Cape Floral Kingdom extends beyond the boundaries of the province, hence the distribution of the Fynbos endemic bird species does so as well. The largest portion of the population of these endemics, however, occurs within the province. The province does have one endemic bird species, the Agulhas Long-billed Lark (*Certhilauda brevirostris*), which is found on the Agulhas plains near Bredasdorp. The different bird habitats (fynbos, karroid, coastal, marine, wetlands, etc.) and ultimately the rich variety and vast numbers of especially wetland and coastal birds has led to the establishment of 23 Important Bird Areas within the province.

Geometric Tortoise (*Psammobatus geometricus*) is listed as Critically Endangered and restricted to lowland alluvial Renosterveld/Fynbos habitat and is a flagship species for conservation of these lowland habitats which have been transformed to a large extent with only a few small fragments remaining. (Image: Andrew Turner).

REPTILES: approximately 153 species

Of the 153 reptile species and subspecies in the Western Cape, 14% are endemic to the province. Eleven species are threatened: three Critically Endangered, two Endangered, six Vulnerable; and eight are Near Threatened. Many reptile species do not tolerate habitat transformation. There are still several undescribed species in the province which need conservation assessment.

Western Leopard Toad (*Sclerophrys pantherina*) is listed as Endangered and restricted to the lowland coastal sandy plains between Cape Town and Cape Agulhas. A large proportion of the population is located within the Southern Suburbs of Cape Town and urban areas of the Cape Peninsula, where efforts are focused at ensured co-existence of the species within the urban environment (Image: Atherton de Villiers).

AMPHIBIANS: approximately 55 species

Of the 55 amphibian species in the Western Cape, 53% are endemic to the province which is a very high level of endemism with a unique local radiation of frog species. Eight species are threatened: three Critically Endangered, four Endangered, one Vulnerable; and six are Near Threatened. There are also at least three undescribed species in the province which need conservation assessment, and the conservation status of a few others may need to be reassessed following the outcome of taxonomic revisions.

FRESHWATER FISH: 21 currently described species and up to 20 undescribed lineages

The Cape Fold Ecoregion, located primarily within the Western Cape Province, is one of the five aquatic ecoregions of Southern Africa. This region is relatively species poor with only 21 currently described indigenous freshwater fish species of which 18 are endemic. There are four families of native freshwater fish in the province. Of these, the Cyprinidae is the most species rich with 16 species belonging to two genera (*Pseudobarbus* and *Enteromius*). Three other families are present in the province, namely the Galaxidae (one species), the Anabantidae (one species) and the Austroglanididae (two species). Ongoing research is revealing high levels of genetic diversity within isolated populations of many species and presents evidence that the current taxonomy vastly underestimates the diversity of freshwater fishes of the Western Cape, as well as the greater Cape Fold Ecoregion.

A recent study estimated the number of unique freshwater fish lineages within currently described species to be in excess of 40 which is roughly double the number of currently described species. The conservation status of all South African freshwater fish species was reviewed in a 2009 IUCN Red List report which listed 13 (62%) Western Cape species as Threatened. Of these, three species are listed as Critically Endangered, seven as Endangered and three as Vulnerable. These figures present an underestimation, as a number of undescribed lineages within several *Pseudobarbus* species have also been assessed as Threatened. Two species near endemic to the Western Cape, the Cape kurper (*Sandelia capensis*) and Cape galaxias (*Galaxias zebratus*) were listed as Data Deficient as there is evidence that they are both species complexes. Two recently described species, *Pseudobarbus skeltoni* and *P. verloreni* have not been formally assessed to date, but are believed to be highly threatened. The primary threat to the indigenous fishes of the Western Cape remains the presence of invasive alien species, followed by habitat degradation and destruction due to unsound land use practices and water over-abstraction and pollution.

Berg River Redfin (*Pseudobarbus burgi*) is listed as Endangered and restricted to the Berg River System and one of several species of redfin (*Pseudobarbus*) with narrow distributions within the Cape Fold Mountains. They are adapted to the clear, acidic waters flowing from the mountains and threatened by the invasion of alien fish species e.g. rainbow trout (*Oncorhynchus mykiss*), bass (*Micropterus* spp.) and sharptooth catfish (*Clarias gariepinus*) (Image: Riaan van der Walt).

INVERTEBRATES: unknown

Invertebrates constitute more than 80% of all animal diversity, yet they are grossly under-represented in studies of African diversity. The focus on the Cape Floristic Region's exceptionally high floristic diversity has overshadowed its faunal diversity and given our incomplete knowledge of the arthropod diversity in the Western Cape, it is very difficult to establish endemism of the group. Few groups have been subject to careful surveys and the only assessments that have been formally conducted according to the latest IUCN criteria are those for the Odonata and Lepidoptera.

There are three species of dragonfly of great concern in the Western Cape, two are CR and one EN. There are 37 species of Lepidoptera that are endemic to the Western Cape but classified as LC. One species is extinct, two species are Critically Endangered Presumed Extinct, eight species are CR, seven species EN and five species VU. Four Lepidoptera species are extremely rare, seven species are habitat specialists and 17 species have a restricted range. Furthermore, approximately 27% of bee species are endemic to the area and each of the 17 species of the wingless stag beetle genus *Colophon* of the Lucanidae is restricted to a single mountain peak in the Western Cape.

Information from the South African National Survey of Arachnida indicates that there are 65 known spider families in the Western Cape, which represents 91% of the families reported to occur in South Africa as well as 343 genera and 863 species (42%) of the total for South Africa. Of these species, about 35% are endemic to the province.

Colophon beetle: Each of the 17 species of the wingless stag beetle genus *Colophon* of the Lucanidae is restricted to a single mountain peak in the Western Cape. Fourteen of these species have been Red Listed (Image: Angelika Loots).

2.6.1 Noteworthy species of human use

Various species within the Western Cape provide a use for humans. Many of these are based on traditional knowledge which has passed down through generations and is specific to the various cultures present and would have been harvested from the natural environment for personal use. In addition to species which are harvested for personal use are those which have a commercial value. Those of commercial value can either be harvested from wild populations or supplemented by cultivation, in which they move into the sphere of agriculture (and fisheries for marine species).

Species of medicinal use through traditional beliefs are almost exclusively harvested from the wild. South Africa has over 2 000 different plant species that are known to be used as a source of traditional medicine, and about 656 of these are actively traded in medicinal markets of KwaZulu-Natal, Gauteng, Limpopo, Eastern Cape and the Western Cape (Driver *et al.* 2012). This activity can result in significant impacts on wild populations, in particular in areas with dense rural populations, which more typically rely on traditional medicine. As such the impact of harvesting of plants of medicinal value is less significant in the Western Cape than other parts of South Africa, however this is still an impact that must be taken cognisance of.

In terms of plant species, bitter aloe (*Aloe ferox*), rooibos tea (*Aspalathus linearis*) and honeybush tea (*Cyclopia subternata*) are three species which are grown commercially. The cut-flower trade includes a number of Fynbos species, in particular the Proteaceae, which are grown commercially.

Animal species are also traded, in particular marine species e.g. abalone (*Haliotis midae*). This species is rapidly depleting due to overexploitation for commercial purposes. Illegal exploitation of abalone is being stimulated by exceedingly high black market prices. Commercial value of the abalone resource outscores the combined values of all other marine resources and is estimated in excess of R100 million per annum. Other marine species which have value for human use include rock lobster (*Jasus lalandii*) as well as a variety of fish species involved in large and small scale fishing, including anchovy and sardine which are food sources to the African penguin.


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In terms of terrestrial species, many species are collected for the exotic pet trade, including Colophon beetles and some butterfly species that are collected for trade; tortoises and other indigenous reptiles that are collected for keeping as pets; animal parts are also collected for traditional medicine and the muthi trade (honey badgers, Cape vultures, baboons, owls, tortoises, etc.); small antelope, i.e. steenbok, Cape grysbok and common duiker occurring close to urban settlements are snared for food and bush meat.

Larger antelope species which are the cornerstone of the expanding game farming and hunting industry in the Western Cape Province consist of local indigenous species as well as other South African species which have been introduced into the province to enable the growth of the game industry. These extra-limital species include blue wildebeest, roan antelope, sable antelope, plains zebra, black wildebeest, giraffe, white rhinoceros, and common reedbuck. Of the South African species introduced into the Western Cape, impala and nyala are of particular concern as they have the potential to become feral and invasive in the province if not adequately managed.

2.7 Patterns of Land Use and other Drivers of Habitat Change

2.7.1 Land use pressures and habitat change

The primary cause of loss of biodiversity in the Western Cape is loss of habitat, as is the case on a global scale. Habitat loss or habitat modification occurs primarily through the introduction of a change in land use which either results in the removal of the habitat to accommodate the new land use, or pressures which impact on the condition of the habitat e.g. overgrazing. Loss of biodiversity also occurs through other factors not related to changes in land use, although these are often also anthropogenic in terms of their origin, e.g. climate change.

The Western Cape economy is based on its unique assets, which includes agricultural resources that make it the country's leading exporter of agricultural commodities and whose value chains (e.g. agri-processing) underpin the province's industrial sector; and its natural capital (i.e. biological diversity) and varied scenic and cultural resources which are the attraction that makes the Western Cape the country's premier tourism destination[8].

The agricultural economy of the Western Cape is concentrated within the areas which are suitable for cultivation, which is predominantly on the nutrient-rich soils on the lowlands, derived from shale and granite geologies, which make it highly suitable for cultivation of grain crops (in particular wheat) and vineyards. The primary grain growing areas are in the Swartland and the Overberg Rûens, which would have historically supported Renosterveld vegetation. The interfaces between these lowland areas and the mountains are most suitable for vineyards, having provided the namesake for the Cape Winelands District Municipality with the wine industry in the Western Cape currently thriving and growing. In addition there is the fruit industry which is based on the more fertile soils, with deciduous fruit growing in the cooler mountain valleys (e.g. Elgin, Ceres), citrus fruit concentrated in the warmer Olifants River Valley, and table grapes in the Hex River Valley. In addition to supporting the largest agricultural economy of all of South Africa's provinces, cultivation in the Western Cape has the longest history of the South African provinces, with cultivation since the arrival of the European settlers. As such, the areas which are suitable for cultivation have been subjected to very high levels of transformation with the few remaining remnants of natural vegetation within these areas now of very high conservation value as a result.

In addition to the crops which have been cultivated for long periods, expansion of irrigation schemes and new technologies have allowed expansion of cultivation in certain areas of the province over the past few decades. Market growth of more recent agricultural products has also resulted in expansion of cultivation areas. This includes potato (irrigation) and rooibos tea (market growth) farming on the acid sands of the Sandveld and lower-lying sections of the Cederberg along the northern areas of the West Coast lowlands. This area has been subject to the highest levels of habitat transformation over the past 10 years in the province and has been a focus area for conservation action e.g. Greater Cederberg Biodiversity Corridor, Sandveld Environmental Management Framework (EMF).

8 Western Cape Provincial Spatial Development Framework. 2014. URL: https://www.westerncape.gov.za/eadp/content/2014-provincial-spatial-development-framework-psdf

Other areas which are not suitable for cultivation are utilised for livestock farming, which would include the extensive grazing land uses found in the Succulent and Nama Karoo. Land management is important in these areas for maintaining biodiversity and productivity, as overgrazing is a common practice and can result in high levels of degradation, and arid ecosystems take a long time to recover from disturbance. Ostrich farming in the Little Karoo trends to be more intensive with high levels of disturbance and transformation.

South Africa has a rich mineral resource wealth and has been one of the most important cornerstones of the economy. Although the northern provinces have traditionally been the focus of the mining industry, the Western Cape does contain important mineral resources and this constitutes a major threat to biodiversity, in particular since many of these resources have not yet been exploited. Areas which have been affected by mining include the Cape Flats, which is an important sand mining resource. The West Coast holds several important mineral deposits including limestone, phosphate and rare earth minerals, which are variously in the process of being mined or under application for mining. Applications for the mining of bentonite and zeonite in the Swellendam region are increasing. Many of these mineral deposits occur in highly sensitive areas which are important for biodiversity. The Central Karoo region could potentially contain important minerals (e.g. uranium) and fossil fuel (e.g. shale gas) resources which are currently under investigation and could result in high levels of transformation in an area that has to date had relatively low levels of transformation.

Urban development is another important source of habitat transformation. Cape Town, as the second largest city in South Africa and one of the country's major economic hubs, is the focus of the most rapid transformation through urbanization. The City of Cape Town Metropolitan Municipality additionally contains very high levels of biodiversity even by the high standards of biodiversity within the province. There are likely to be very few major cities in the world that can compare with Cape Town in terms of the levels of biodiversity within the municipal boundaries. Many of the species and habitats are restricted to the municipal boundaries and cannot be conserved elsewhere. Expansion of the city is constrained by topography and competing land uses (e.g. highly productive agricultural land) and the lowland areas within the expansion areas are under extremely high levels of threat (Rebelo *et al*. 2011).

Elsewhere in the province, the industrial development zone based around the Saldanha Port is another focus area of habitat transformation, mainly through industrial development, but is also likely to result in further transformation due to associated housing and infrastructure requirements. The Saldanha Peninsula is home to several unique habitats which are being threatened by both the current and proposed development.

The Western Cape is a popular tourism destination, with the coastline being the focus of high levels of development for holiday homes and lifestyle developments (including golf course estates), often being located in environmentally sensitive areas in order to access the natural aesthetic value while ironically simultaneously compromising it. This is particularly prominent along the Garden Route and in the Overstrand area. An additional focus area for these types of developments is within the Stellenbosch and Drakenstein Municipalities due to the scenic mountain and vineyards environment.

It is worth noting the following extract from the Provincial Spatial Development Framework (PSDF) which makes explicit the link between the natural resource base of the province and the economy (Western Cape Government 2014a):

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The significance of the aforementioned provincial asset base stems from the fact that it:

- is the origin of life-supporting ecosystem services (e.g. clean air and water);
- underpins the provincial economy, particularly agriculture which provides food security, sustains rural livelihoods and draws income into the province and tourism;
- makes up globally significant and diverse habitats of rare and endangered biodiversity;
- makes the Western Cape a world class tourism destination, given the attraction and authenticity of rural landscapes of scenic, cultural and natural splendour; and
- provides the location of diverse outdoor recreational and leisure activities for residents of and visitors to the Western Cape.

Key challenges as listed in the PSDF are in agreement with the discussion above:

- Land transformation (i.e. conversion from natural to manmade landscapes), is the primary cause of biodiversity loss and deteriorating ecosystem health. The main threat is in the lowlands, particularly in areas intensively cultivated and subject to urban growth pressures (i.e. Cape Winelands District and Cape Town Metro).
- Climate change is predicted to be a major long-term threat to biodiversity, as it is likely to cause a shift in species distribution. The Succulent Karoo Biome is most at threat.
- Over-abstraction and modification of natural watercourses is altering flow regimes, which impacts on species migration and breeding, aquatic habitats, food resources, and wetland ecosystems.
- There has been an increased frequency and shifts in the fire season, which impacts negatively on biodiversity.
- If biodiversity threats are not reduced, some ecosystems could collapse, requiring expensive intervention to maintain or replace them.

This underscores the importance of the WCBSP in ensuring well-informed, environmentally and socially sustainable land use planning.

In addition to causing direct habitat loss, alien invasive plant species have significant impacts on the Western Cape's water security. Cultivation, plantation forestry and infestations of alien invasive trees lower the water table and poorly located or poorly managed mining affects the quantity and quality of both surface water and groundwater, which ultimately impacts on the broader freshwater resources. The land uses described above do however all make important contributions to the provincial and national economy, and the WCBSP should be used to locate future agricultural, forestry and mining operations in areas that pose the least risk to biodiversity and ecosystem health and the long-term sustainability of the province.

The PSDF also makes explicit reference to the importance of water resources to the province: "Water will be the key determinant of future Provincial economic growth and development". In terms of key water users it refers specifically to agriculture (Breede Valley, Olifants-Doorn Valley), industry and urban (Cape Metro, greater Saldanha and Southern Cape), with particular reference to the demands on the Berg River catchment for both the Cape Town and Saldanha functional regions, which is one of the primary motivations for the implementation of the Berg River Improvement Plan.

In terms of the action required, the PSDF states the following: "There is a strong need for the aggressive protection and rehabilitation of river systems and ground water recharge zones, particularly in those areas where there is intensive land use (such as agricultural activity or settlement area). Water-wise settlement making (such as appropriate sanitation systems, localised water storage systems and grey water systems) must be mainstreamed in all settlements of the province, particularly the high growth potential and water-scarce settlements of the province."

2.7.2 Climate change as a driver of habitat change

Climate change is more than simply an increase in global temperatures; it encompasses changes in regional climate characteristics, including temperature, humidity, rainfall, wind and severe weather events, which also have economic and social dimensions. Although there is still a lot of debate internationally about climate change and its causes and impacts, there is enough evidence to show that global climate change is taking place, and common sense dictates that decision-makers should take a precautionary approach and build climate change strategies into their long-term planning.

Climate change poses significant threats to the basic provisions of life including water, the environment, health and food production, with poorest communities likely to be the hardest hit. Some expected global impacts on biodiversity and ecosystems include:

- Globally, 20–30% of species may become extinct as temperatures increase;
- The majority of endemic species are likely to show contractions of geographic range, and up to 30% of endemics may be at increasingly high risk of extinction;
- Changes in the seasonality or migration of plant and animal species.

It is anticipated that the average temperatures in the CFR will warm by roughly 1.8°C by the middle of the 21st century (±2050) (Midgley *et al*. 2002). The region is also anticipated to become drier, intensifying stress on the Fynbos. The result of this would be shrinkage of the Fynbos Biome, being replaced by more arid Biomes. Species distributions are hence predicted to change, however the mobility of the species distributions are fully dependent on the presence of intact corridors that can facilitate this movement. Species located in isolated fragments are likely to become extinct if they are unable to withstand the change in climate. Species in the areas currently experiencing the highest rainfall areas in the Western Cape (e.g. Boland Mountains), will not have any areas of the same climate to migrate to. It is anticipated that 21–40% of the Proteaceae, one of the most dominant and distinctive plant families of the Fynbos, will become extinct, with the wide range dependent on the ability of species to migrate (Hannah *et al*. 2005).

Habitat fragmentation, caused by a variety of impacting activities, has been identified as one of the greatest threats to biodiversity, as, amongst other things, it increases the vulnerability of ecosystems to climate change. Maintaining or enhancing habitat connectivity so that plant and animal communities can move is the most recommended response for climate change (see Box 2.5). In fragmented landscapes, the survival of plant populations depends on sufficient rates of migration between fragments to counteract local extinctions and maintain species diversity. Improving connectivity across the landscape reduces the effects of fragmentation by making more habitat available by means of a network of corridors. Furthermore, the effectiveness of landscape connectivity is enhanced by linking up areas of high conservation value. A 2009 study, commissioned by the Table Mountain Fund, identified 28 climate change adaptation corridors towards ensuring spatial connectivity between conservation landscapes with the view to adapt to the challenging effects of climate change (Pence 2009).

Identifying and securing habitat linkages, particularly bottle-necks or 'pinch-points' in corridor networks, adds significantly to the overall functionality of such a network. Therefore the WCBSP analysis included detailed planning for securing a network of corridors across the province (See Chapter 3).

Decision-makers and planners can reduce the effects of global climate change by integrating the BSP Map and guidelines into land use planning and decision-making, and by adhering to wise management guidelines, such as:

- identifying key climate adaption corridors required for long term persistence of biodiversity pattern and process and implementing measures to protect the remaining corridor network (refer to the climate change adaptation corridors – Pence 2009), particularly critical linkages, with biodiversity-compatible land uses;
- maintaining intact riparian (river bank) and watercourse vegetation;

- protecting water resources including especially water source areas, watercourses and groundwater recharge areas;
- managing invasive alien species;
- implementing appropriate fire management, and restoring and maintaining biodiversity for carbon storage.

In addition to safeguarding the environment, these measures can assist with disaster management, by reducing the vulnerability of human communities and built infrastructure to the impacts of natural disasters such as floods and droughts.

In a study undertaken regarding the vulnerability of the global biodiversity hotspots to climate change, particularly with respect to the extinction of endemic species, the CFR was one of the top seven hotspots out of the total of 25 that were of highest vulnerability (Malcolm *et al*. 2006). Based on the models, the CFR exhibited significantly higher levels of habitat loss than the average. The Succulent Karoo also exhibited higher levels than the average. Migration rates were also modelled and incorporated into the assessment. The projected plant species extinction rates modelled, exceeded 3 000 plant species for four biodiversity hotspots, namely the CFR, Caribbean, Mediterranean Basin and Tropical Andes (Malcolm *et al*. 2006).

Box 2.5 **Strengthening ecosystem resilience**

Creating functional connectivity in landscapes is a key aspect of promoting ecosystem resilience (the ability of the ecosystem to absorb a certain amount of change, yet still remain functional). Ecosystem resilience can be maintained or built through an approach that focuses on intact areas, maintaining biodiversity priority areas in a natural or near-natural state, maximising connectivity between these areas and maximising the diversity of species and ecosystems. Resilient ecosystems are able to:

- Maintain the ecological and evolutionary processes that allow biodiversity to persist in these ecosystems;
- Better withstand human-induced pressures (from, for example, too frequent fires);
- Adapt the impacts of climate change, such as increased rainfall variability;
- Mitigate the effects of climate change by continuing to capture and store carbon;
- Deliver ecosystem services, such as the provision of clean water and flood attenuation.

2.8 Protected Areas and Conservation Areas

Protected areas in South Africa are defined as parts of the landscape that are formally protected by law in terms of the NEM:PAA, and managed primarily for the purpose of biodiversity conservation. The NEM:PAA provides for any land, including private, communal or municipal land, to be declared a formal protected area, and allows for co-management of such a protected area by the landowner(s) or any suitable person or organisation.

Conservation areas are those areas of land not formally protected by law, but informally protected by the current owners and users, and managed at least partly for biodiversity conservation. Conservation areas are therefore not considered formally protected areas as they are not gazetted in terms of the NEM:PAA and do not allow for long-term security of tenure. They could include areas covered by Biodiversity Management Agreements in terms of the NEM:BA; Biodiversity Agreements signed in terms of contract law between a landowner

and a conservation agency; as well as Voluntary Conservation Partnership Agreements and Conservancies, which are agreements for co-operation among neighbouring landowners and require no legal long-term commitment from the landowners (see Figure 2.9).

A complete protected area network must not only represent the full range of plant and animal species in large enough habitats to support them, but must also include landscape-scale natural systems and processes, aquatic and marine habitats and be ecologically functional and resistant to the impacts of climate change. This must also be achieved in a reasonable amount of space without impacting negatively on livelihoods or economic production. As the provincial conservation authority, CapeNature is the lead agency responsible for conserving the Western Cape's biodiversity and resources for future generations.

2.8.1 Types of Protected Areas

Section 9 of the NEM:PAA distinguishes between several types of protected areas, namely Special Nature Reserves, National Parks, Nature Reserves, and Protected Environments. It also recognises World Heritage Sites declared in terms of the World Heritage Convention Act; Marine Protected Areas in terms of the Marine Living Resources Act and/or the NEM:PAA; specially protected Forest Areas declared in terms of the National Forests Act; and Mountain Catchment Areas (MCAs) declared in terms of the Mountain Catchment Areas Act. Protected areas can include privately-owned areas if they have been formally declared as National Parks, Nature Reserves or Protected Environments under NEM:PAA. In addition, while not specifically named in the NEM:PAA, both Local Authority Nature Reserves and Private Nature Reserves must be regarded as having been declared [NEM:PAA Sections 12 and 23 (5)] and are therefore deemed to be protected areas under NEM:PAA.

In the Western Cape Province, about 80% of land that has important biodiversity on it, does not fall within formally protected areas, but is privately or communally owned land. The Biodiversity Stewardship Programme offers conservation options to set up partnerships for managing and protecting natural assets. Two of the options (Nature Reserve and Protected Environment) include declaration in terms of the NEM:PAA. The other options comprise contractual agreements between the landowner(s) and a conservation authority such as CapeNature or SANParks. Accounting for all of the above-mentioned types, the current protected area network amounts to 14.5% of the Western Cape.

It should be noted that although MCAs are included within the protected area layer, they do not currently have any formal status in terms of legislated restricted activities. MCAs are located on private land typically as a buffer to existing nature reserves within the Cape Fold Mountains. The Mountain Catchment Areas Act makes provision for the development of regulations which could control land use and activities within the MCA, however these have not yet been enacted. CapeNature is in the process of compiling a position statement in terms of allowable land uses within an MCA from the perspective of commenting on development applications. The basis would be that no land use or activity may be permitted which could affect the steady supply of good quality water to the downstream areas of the catchment, and thus would in general exclude buildings, hard infrastructure and cultivation. Concurrently, there is the intention to incorporate the MCAs adjacent to the Cape Floral Region Protected Areas World Heritage Site as buffers to the core of the WHS, thereby providing additional controls on land use.


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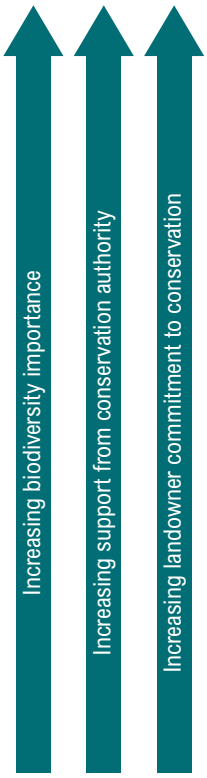

TYPE OF AGREEMENT	LEGAL MECHANISM	
Nature Reserve	National Environmental Management: Protected Areas Act (Act 57 of 2003)	• Favourable for sites with highest biodiversity importance • Binding on property: declaration of Nature Reserve, and a title deed restriction • Binding on landowner: contract with landowner usually for 30–99 years/in perpetuity • Contributes to South Africa's protected area estate
Protected Environment	National Environmental Management: Protected Areas Act (Act 57 of 2003)	• Favourable for declaration over multiple properties • Less restrictive land use than Nature Reserve • Binding on property: declaration of Protected Environment, and a title deed note • Binding on landowner: contract with landowner usually for 30–99 years/in perpetuity • Contributes to South Africa's protected area estate
Biodiversity Management Agreement	National Environmental Management: Biodiversity Act (Act 10 of 2004)	• Shorter term, less restrictive than protected area declaration • Binding on landowner: contract with landowner ideally 5–10 years • Contributes to South Africa's Conservation Area Estate
Biodiversity Agreement	Contract law	• Less restrictive than protected area declaration • Binding on landowner: contract with landowner ideally 5–10 years • Contributes to South Africa's Conservation Area Estate
Biodiversity Partnership Area	Informal agreement	• Non-binding partnership • May include a Memorandum of Understanding

FIGURE 2.9: Stewardship options available to land owners

2.8.2 Western Cape Protected Area Expansion Strategy

The existing protected area network does not adequately protect the majority of ecosystems and biodiversity of the Western Cape. Establishment of additional protected areas in the most threatened and under-conserved habitats in the Western Cape are thus essential. Therefore, the Western Cape Government has drafted a Western Cape Protected Areas Expansion Strategy and Implementation Plan, which is aligned to the National Protected Area Expansion Strategy, but identifies some different spatial priorities (Western Cape Government 2015).

The primary focus of the Western Cape Strategy is twofold:

- To expand the Western Cape protected area network to encompass a more representative and resilient suite of areas that support biodiversity and ecological infrastructure, especially those threatened species and ecosystems that remain as yet unprotected; and
- To regularise existing protected areas, so that environmental security is ensured for everyone in South Africa and the costs and benefits of protection accrue to the appropriate entity.

2.8.3 Mechanisms for consolidation and expansion of the Protected Area network

The acquisition of land for conservation through purchase by the state is no longer a common occurrence due to budget availability. As a result, the conservation sector has become increasingly creative at devising alternative and more contemporary mechanisms with which to expand the formal protected area network of the Western Cape.


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Thus, the Western Cape Protected Areas Expansion Strategy focuses on the following mechanisms:

Formal protection of private conservation-worthy lands through Biodiversity Stewardship: Biodiversity Stewardship is an approach to protecting important biodiversity features on private or communal land by working with landowners to formalise their involvement in conservation. At the highest level of engagement, a contractual agreement to declare the land as a Nature Reserve is signed between the landowner and the conservation authority, with one of the two parties – or a third party (e.g. a conservation NGO) – assigned as the Management Authority. A 'reactive' stewardship model has also emerged whereby a new protected area is created through the mitigation requirements of a regulatory authorisation.

Transfer of forest exit lands and other state-owned lands into conservation custodianship: This entails securing publically-owned lands with high biodiversity value as protected areas; including the transfer of Forestry Exit Lands which are not viable for forestry into conservation custodianship. In addition, it can include other state lands not currently legally declared or vested with a conservation agency, as has recently been done for over 7 000 ha of state land in the Dassenberg Coastal Catchment Partnership area.

Purchase of land in collaboration with NGOs: Where funding is available from external funding sources such as trusts and donors, land can be purchased and declared as protected areas. The land purchased usually has to conform to the stipulations or requirements of the funder, e.g. land purchased specifically for the conservation of specific plant species or important bird areas.

Declaration of Marine Protected Areas: Operation Phakisa is a national initiative led by the Department of Environmental Affairs (DEA) aimed at unlocking the economic potential of South Africa's oceans. A component of this project is the formal declaration of priority marine habitats as Marine Protected Areas (MPAs) under the NEM:PAA. The Western Cape supports the proposed MPAs and the target of protecting 10% of South Africa's Exclusive Economic Zone through Operation Phakisa.

Protected Area regularisation and NEM:PAA compliance: In addition to expanding the protected area network, the environmental security of existing protected areas needs to be better ensured by addressing historical irregularities in protected area administration and increasing NEM:PAA compliance across the entire network. The focus will be on the appropriate vesting of state lands currently managed for biodiversity, the translation of local authority and Private Nature Reserves into NEM:PAA-compliant Nature Reserves, and the regulation or other appropriate means of effecting meaningful protection to private Mountain Catchment Areas.

It is also worth mentioning several supporting actions intended to help address regularisation and compliance at an administrative level rather than per individual protected area. These include, amongst others, the gazetting of the provincial Biodiversity Bill, the establishment of a provincial protected area register, and formalising biodiversity protection through Memoranda of Understanding between conservation agencies and partnering NGOs.

03 Spatial Assessment and Map Products

IN THIS CHAPTER:

This chapter presents and describes the final spatial product, including the various map categories used, and how they were arrived at. Importantly, it outlines the approach taken, explaining how the principles of systematic biodiversity planning were adhered to, the data layers and targets used, and other key parameters of the analysis. It concludes with a summary of advances made with the production of the WCBSP, over previous products.

3.1 Development of the Biodiversity Spatial Plan Maps

The WCBSP includes a map of biodiversity importance for the entire province, covering both the terrestrial and freshwater realms, as well as major coastal and estuarine habitats. The product is referred to as the Biodiversity Spatial Plan Map (BSP Map – Figure 3.1). This chapter does not include full technical details of the spatial analyses that underpin this map, as these will be available in the Technical Report (from CapeNature or on the BGIS website[9]). It does, however, include a summary of the BSP Map categories, the types of data and approach used, and highlights hallmark characteristics of the spatial products and technical advances in the development thereof (See Sections 3.2 and 3.3 below).

A BSP Map is the product of a systematic biodiversity plan that delineates, on a map, CBAs and ESAs, which require safeguarding to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services.

3.1.1 Definitions of the Biodiversity Spatial Plan Map Categories

The BSP Map shows the following five broad biodiversity priority categories, as per SANBI's Technical Guidelines for biodiversity maps (see also Table 3.1 below):

Protected Areas (PAs): Areas that are formally protected by law and recognised in terms of the NEM:PAA. This includes gazetted private Nature Reserves and Protected Environments concluded via a stewardship programme.

9 http://bgis.sanbi.org/

Critical Biodiversity Areas (CBAs): Areas that are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure. These include:

- All areas required to meet biodiversity pattern (e.g. species, ecosystems) targets;
- Critically Endangered (CR) ecosystems (terrestrial, wetland and river types);
- All areas required to meet ecological infrastructure targets, which are aimed at ensuring the continued existence and functioning of ecosystems and delivery of essential ecosystem services; and
- Critical corridors to maintain landscape connectivity.

CBAs are areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. Degraded areas should be rehabilitated to natural or near-natural condition. Only low-impact, biodiversity-sensitive land uses are appropriate.

In the maps, a distinction is made between CBAs that are likely to be in a natural condition (CBA 1) and those that are potentially degraded or represent secondary vegetation (CBA 2). This distinction is based on best available land cover data, but may not be an accurate or current reflection of condition.

Ecological Support Areas (ESAs): Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services. They support landscape connectivity, encompass the ecological infrastructure from which ecosystem goods and services flow, and strengthen resilience to climate change. They include features such as regional climate adaptation corridors, water source and recharge areas, riparian habitat surrounding rivers or wetlands, and Endangered vegetation.

ESAs need to be maintained in at least a functional and often natural state, in order to support the purpose for which they were identified, but some limited habitat loss may be acceptable. A greater range of land uses over wider areas is appropriate, subject to an authorisation process that ensures the underlying biodiversity objectives and ecological functioning are not compromised. Cumulative impacts should also be explicitly considered.

In the maps, a distinction is made between ESAs that are still likely to be functional (i.e. in a natural, near-natural or moderately degraded condition; ESA 1), and Ecological Support Areas that are severely degraded or have no natural cover remaining and therefore require restoration (ESA 2).

Other Natural Areas (ONAs): Areas that have not been identified as a priority in the current biodiversity spatial plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for meeting biodiversity targets, they are still an important part of the natural ecosystem.

ONAs should be managed or utilised in a manner that minimises habitat and species loss and ensures ecosystem functionality through strategic landscape planning. These 'other natural areas' offer considerable flexibility in terms of management objectives and permissible land uses, but some authorisation may still be required for high impact land uses.

Severely Modified to No Natural Remaining (NNR): Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructure functions, even if they are never prioritised for conservation action.

These areas offer the most flexibility for land use, but these should be managed in a biodiversity-sensitive manner, aiming to maximise ecological functionality. Authorisation is still required for high-impact land uses.

In the BSP Map, five sub-categories of CBA and 11 sub-categories of ESA are recognised, reflecting the dominant feature for the area of interest (e.g. wetland, river, forest, estuary). These are summarised below in Table 3.2.

3.1.2 Biodiversity Spatial Plan Map

The provincial BSP Map (Figure 3.1) was developed using systematic biodiversity planning methodology, following the approaches of Margules and Pressey (2000) and Ardron *et al.* (2010). The data were analysed using specialised software called Marxan (Game & Grantham 2008) accessed via an open-source GIS platform, QGIS, and the plugin (interface software) CLUZ (Smith 2016).

Marxan calculates the most efficient selection of planning units required to meet all biodiversity, ecological sustainability and climate resilience targets, while favouring persistence and avoiding areas of competing land uses. Marxan is based on an algorithm that runs through millions of options to identify the best selection (configuration) of planning units to meet targets. This 'best-design' solution, as well as the summed selection score for each planning unit (i.e. the importance of any single site for meeting biodiversity targets) and an 'irreplaceable feature' rule-set, are used to create the final BSP Map.

It is important to note that while the systematic biodiversity assessment was run for the province as a whole, the City of Cape Town's (CCT) 2016 Biodiversity Network (BioNet) replaced the provincial Marxan solution in all final products. This is due to the fact that the CCT's BioNet analysis was run using a similar systematic planning approach but with a finer-scale suite of biodiversity features and data, and also a rule-set specifically designed for the CCT's unique needs. The BioNet has also been adopted as policy by the City Council. Thus, the BioNet is a more appropriate planning tool for the metro, and should be directly referred to for any spatial planning within the CCT's boundaries. However, for the purposes of presenting a complete and consistent provincial product, the CCT's BioNet categories and 2016 spatial products were cross-walked (reconciled) with the WCBSP categories and products and included therein.


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3.1.3 Extent of land incorporated in Critical Biodiversity Areas, Ecological Support Areas and other map categories

Within the Western Cape Province, which extends over more than 12.9 million ha, approximately 2.9 million ha (22%) have been identified as CBA in the 2016 spatial biodiversity assessment. Just over 14% of the province is already formally protected, nearly 19% has no natural cover remaining, and 32% has been identified as Other Natural Area. The remaining 13% of the province falls into the priority category of Ecological Support Area (Table 3.1; also see Table 4.1).

TABLE 3.1: Biodiversity priority categories and extend within the Western Cape Province

Map Category	Area (ha)	%
Protected Area (PA)	1 843 029	14
Critical Biodiversity Area (CBA)	2 859 785	22
Ecological Support Area (ESA)	1 644 503	13
Other Natural Area (ONA)	4 137 042	32
No Natural (NN)	2 445 206	19
TOTAL :	12 944 115	100

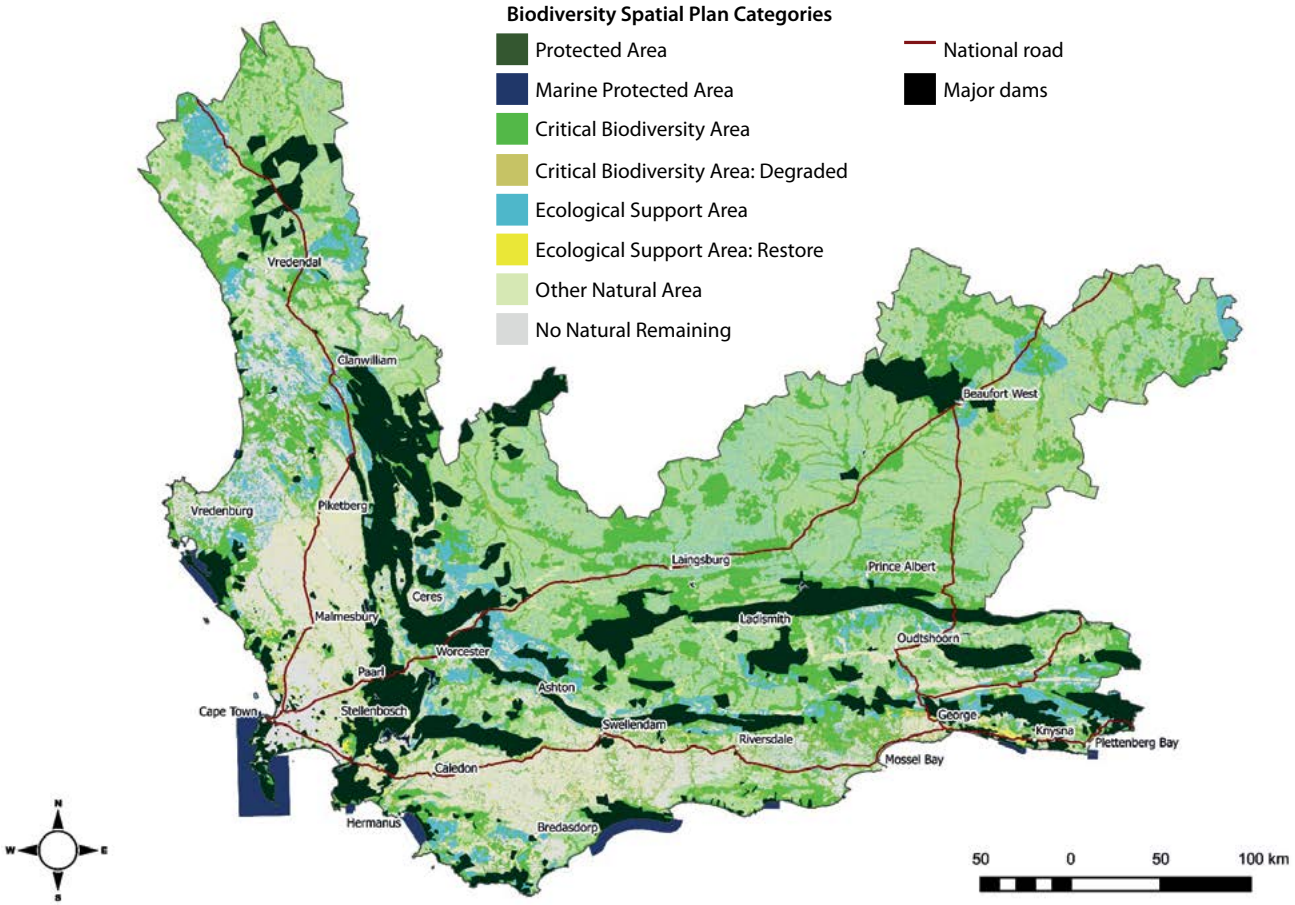

FIGURE 3.1: Biodiversity Spatial Plan Map of the Western Cape

TABLE 3.2: Summary of map categories and their meanings

MAP CATEGORY	DEFINITION	DESIRED MANAGEMENT OBJECTIVE	SUB-CATEGORY
Protected Area	Areas that are proclaimed as protected areas under national or provincial legislation.	Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. A benchmark for biodiversity.	n/a
Critical Biodiversity Area 1	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.	CBA: River CBA: Estuary CBA: Wetland CBA: Forest CBA: Terrestrial
Critical Biodiversity Area 2	Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a functional, natural or near-natural state, with no further loss of natural habitat. These areas should be rehabilitated.	CBA: Degraded
Ecological Support Area 1	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	ESA: Foredune ESA: Forest ESA: Climate Adaptation Corridor ESA: Coastal Resource Protection ESA: Endangered Ecosystem ESA: River ESA: Estuary ESA: Wetland ESA: Watercourse Protection ESA: Water Source Protection ESA: Water Recharge Protection
Ecological Support Area 2	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.	Restore and/or manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services.	ESA: Restore from NN
ONA: Natural to Near-Natural	Areas that have not been identified as a priority in the current systematic biodiversity plan, but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.	ONA: Natural to Near-Natural ONA: Degraded
No Natural Remaining	Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructure functions, even if they are never prioritised for conservation action.	Manage in a biodiversity-sensitive manner, aiming to maximise ecological functionality. Offers the most flexibility regarding potential land uses, but some authorisation may still be required for high-impact land uses.	No Natural Remaining

3.2 Approach, Data Layers and Parameters Used

Given the increasing number of people on the planet, and their demands on natural resources, it is essential that conservation efforts be strategic, efficient, and mainstreamed. Priority areas for both production and protection must be identified and ultimately reflected in our daily decisions surrounding land and resource use. Systematic biodiversity planning helps direct and focus conservation action by setting clear goals and identifying the most effective places for protection.

Because of its basis in sound science, and its internationally recognised principles, methods and techniques, systematic biodiversity planning has become the standard approach to biodiversity planning in South Africa.[10] The following excerpt from the Guideline regarding Bioregional Plans (Government Gazette No.32006, 2009) highlights key characteristics of the approach:

The **principle of representation**. The plan identifies areas needed to conserve a representative sample of all biodiversity pattern (species, communities, ecosystems, etc.).

The **principle of persistence**. The plan identifies areas needed to maintain ecological and evolutionary processes that allow biodiversity to persist in the long term.

Biodiversity targets. Quantitative targets are set for biodiversity features, indicating how much of each feature is required in order to conserve a representative sample of biodiversity pattern and key ecological processes.

Efficiency and conflict avoidance. The configuration of priority areas identified in the plan is designed to be spatially efficient (i.e. to meet biodiversity targets as efficiently as possible in terms of the amount of land required) and where possible to avoid conflict with other land uses where these are known to exist.

While adhering to these principles, a systematic biodiversity planning approach involves the following broad steps (Cadman 2016):

Map a wide range of information about biodiversity features and patterns of land and resource use, to understand what is located where.

- **Set biodiversity targets** that show how much of each feature is needed to conserve it.
- **Analyse the data** using systematic biodiversity planning software – this identifies what needs to be prioritised and where, highlighting the most efficient options for meeting all biodiversity targets, as well as other possible (but less efficient) alternatives.
- **Interpret** the results of the biodiversity assessment and generate a biodiversity priority areas map (a.k.a. BSP Map) and land use guidelines.

The subsections that follow provide more information about the specific approach taken in the development of the WCBSP. Even more detail and scientific references are available in the Technical Report[11].

10 Department of Environmental Affairs and Tourism. 2009. Guideline regarding the Determination of Bioregions and the Preparation of and Publication of Bioregional Plans. Government Gazette No. 32006. Published in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Government Printer, Cape Town.

11 Pence, G.Q.K. 2017. The Western Cape Biodiversity Spatial Plan: Technical Report. Unpublished report. Western Cape Nature Conservation Board (CapeNature), Cape Town.

3.2.1 Outline of steps taken in the production of the Biodiversity Spatial Plan

The production of the WCBSP entailed the following four main steps:

1. **Map (source or generate all spatial data)**
    a. Developed a **planning unit layer** which divided the entire study area (province) into appropriate units of analysis.
    b. Compiled GIS layers which allowed the following to be determined for each planning unit:
        i. **Protection status** (Protected Areas layer);
        ii. **Habitat condition** (Land Cover and Ecosystem Remnant Layers);
        iii. **Contribution(s) to biodiversity targets** (see Feature Layers below);
        iv. **Selection 'cost'** (to influence spatial design, including efficiency and conflict avoidance; WCBF 2014 CBA Layer, Ecosystem-Based Adaptation Layer, Neighbouring Priorities, Urban Edges).
    c. Sourced or created maps of **biodiversity pattern features** (see also Section 3.2.2 and Table 3.3 below):
        i. Ecosystems (terrestrial vegetation types, coastal habitats, indigenous forest types, river types, wetland types and estuaries);
        ii. Species (threatened plants, amphibians, fish, birds, butterflies, reptiles, odonates and mammals, and species for which a BMP-S exists or is in progress – Cape Mountain Zebra, Bontebok, Geometric Tortoise, Clanwilliam Sandfish, Barrydale Redfin, and African Penguin.
    d. Sourced or created maps of **ecological persistence features** (see also Section 3.2.2 and Table 3.3 below; spatial surrogates for a variety of ecological processes, ecological infrastructure, and climate resilience attributes; see Table 3.3).
2. **Set biodiversity targets**
    a. Aligned targets to national biodiversity thresholds for pattern and process, based on best available science (see Section 3.2.3 and Table 3.3);
    b. Adjusted targets where necessary to address deficits in biodiversity 'stocks' or features.
3. **Analyse the data**
    a. Created and formatted input files (e.g. a matrix of contributions per planning unit, summary of targets used and targets already met by current protected areas);
    b. Calibrated Marxan parameters (Boundary Length Modifier, Feature Penalty Factor, Planning Unit Cost, Number of Runs and Iterations);
    c. Ran Marxan (300 000 000 iterations x 100 runs) to generate Selection Frequency Score and Best Solution results;
    d. Screened results with specific attention given to urban edges, special habitats, and corridors.
4. **Interpret results**
    a. Translated Marxan outputs into maps of Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas and areas of No Natural Remaining, by:
        i. Replacing planning units with remnant data;
        ii. Augmenting remnants with relevant feature attributes;
        iii. Applying a feature-based rule set to combine the 'best-design' solution with other features that must be categorically included (e.g. all CR vegetation remnants).

The subsections below provide a summary of how the WCBSP spatial assessment adhered to the key characteristics of representation and persistence (Section 3.2.2), quantitative target setting (Section 3.2.3), and efficiency and conflict avoidance (Section 3.2.4).


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3.2.2 Representation and persistence

For biodiversity to be appropriately addressed in land use planning and environmental assessment, both biodiversity pattern (representation) and ecological processes (persistence) must be adequately considered (Cadman 2016). That is, both the distribution and variety of native life forms and the ecological and evolutionary processes that maintain them, must be taken into account. As briefly discussed above, this is done by mapping a set of features selected as surrogates for the full array of biodiversity pattern and ecological processes occurring in a region.

For the Western Cape, a total of 2 625 features were included in the analysis, including 'coarse-filter' biodiversity pattern features such as vegetation units and wetland types, 'fine-filter' features such as species occurrences, and ecological persistence features such as water source areas and climate adaptation corridors. These are listed and described more fully in Table 3.3. All data were carefully vetted to ensure reasonable accuracy and applicability to assessment objectives.

3.2.3 Quantitative targets

Ecosystem services, ecological and evolutionary processes, and native species are lost when landscapes are modified beyond certain thresholds. Using best available science and data, key thresholds for assessing ecosystems and setting spatial targets have been established in South Africa's biodiversity sector community of practice. These thresholds indicate the points at which it is estimated the limits of acceptable change will be reached – that is, the point at which, unless corrective management is put in place, an ecosystem could undergo irreversible change and become something quite different (Cadman 2016).

Thus, targets were set for each feature, indicating how much of each is required in order to either conserve a representative sample of biodiversity pattern, or to maintain key ecological processes and infrastructure. Generally, representation targets are around 20% of the original extent of an ecosystem (though for terrestrial ecosystems they range from 16 -36%; as per Driver *et al.* 2012 depending on diversity) and persistence targets aim for 60% of a system remaining intact (i.e. in a natural or near-natural state; e.g. Svancara *et al.* 2009 – see Figure 3.2). For species, targets are generally set at 11 localities or sufficient area to support a population of 10 000 individuals, which correlate with IUCN thresholds for listing species as threatened (i.e. VU status; as per Pfab *et al.* 2011).

Table 3.3 below summarises the features included in the WCBSP's spatial assessment, the source dataset used and the target-setting approach taken.

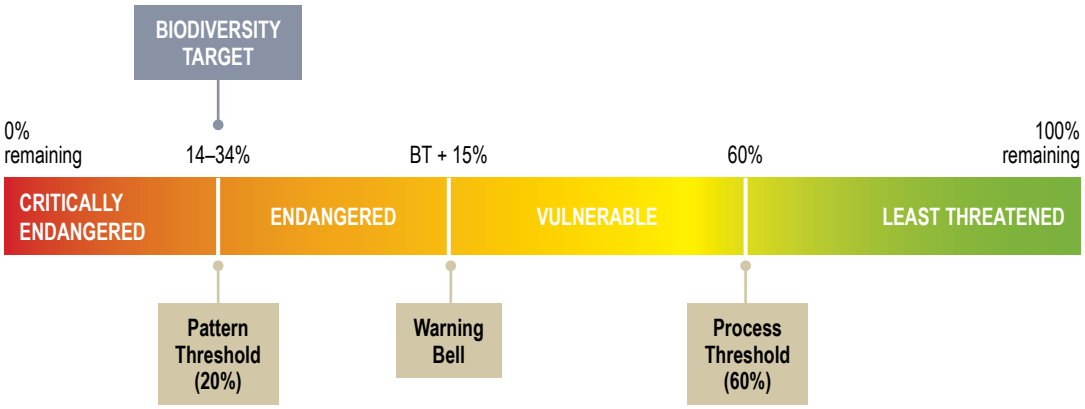


FIGURE 3.2: Illustration of where thresholds of potential concern have been identified, relative to the degree of ecosystem intactness, and how this relates to quantitative targets used for features in the spatial assessment

TABLE 3.3: Features included in the spatial assessment of the Western Cape Biodiversity Spatial Plan

Features	Description of data and target setting approach
Biodiversity Pattern *Representing the diversity of local species, habitats, ecosystems and ecological processes*	
Vegetation Units	Based on the SA Vegetation Map (Mucina & Rutherford), 2012 version[12]. National ecosystem targets used. Values range from 16 to 36% of original extent.
Vegetation Variants	Based on the combined extent of the Vlok fine-scale vegetation maps (2014[13]). A 'seeding' target of 10% used for representation at the variant level.
Coastal Habitat Types (landward)	From Integrated Coastal Habitat Map, 2015 version (Harris[14]). Biodiversity Pattern target of 20% of original extent used; except Foredunes, where a Process target of 60% was used.
Indigenous Forest Types	Combination of DAFF's Indigenous Forest Inventory Map and the Western Cape's 2013/14 Land cover product (natural forest classes). National ecosystem target used (34% of original extent).
Wetland Types	Combination of the National Wetland/NFEPA Map and the Western Cape's 2013/14 Land cover product (natural wetland classes). Biodiversity Pattern target of 20% of original extent used.
River Types	Based on NFEPA River products, translated onto 1:50 000 river network data. Biodiversity Pattern target of 20% of original extent used.
Estuaries	From National Estuaries layer (Van Niekerk & Turpie 2012). Target of 100% of remaining intact area used for Core estuaries and 60% of functional area used for non-Core estuaries.
Threatened Plants	From SANBI's Threatened Species Programme plant locality data. 100% target used for threatened taxa with limited localities (<11) and target of 11 localities used for other threatened taxa.
Threatened Amphibians and Amphibian Wetland Guild	All threatened taxa extracted from CapeNature's biodiversity occurrence database, plus set of wetland guild species (regardless of threat status); both with a target of 11 localities.

12 Mucina & Rutherford. 2012. Vegetation map (http://www.bgis.sanbi.org)

13 Vlok. 2014. Fine-scale vegetation maps (http://www.bgis.sanbi.org)

14 Harris. 2015. Integrated Coastal Habitat map (http://www.bgis.sanbi.org)

Features	Description of data and target setting approach
Biodiversity Pattern *Representing the diversity of local species, habitats, ecosystems and ecological processes*	
Threatened Fish	Represented by the following NFEPA project features: fish sanctuaries, fish support areas, and priority subcatchments, plus FEPA rivers. In addition, all threatened taxa were extracted from CapeNature's biodiversity occurrence database and localities in smaller tributaries were included with a target of 11 sites per species.
Threatened Birds	All threatened taxa extracted from CapeNature's biodiversity occurrence database, plus data indicating Verreaux's Eagle nesting sites; target of 11 locations per species used. Important Biodiversity and Bird Areas (IBBAs) included as overlays (Listing Notice 3).
Threatened Butterflies	From CapeNature's biodiversity occurrence database, plus SANBI's butterfly dataset; target of 11 locations per species used.
Threatened Reptiles	From CapeNature's biodiversity occurrence database, plus SANBI's reptile dataset; target of 11 locations per species used.
Threatened Odonates (Dragonflies and Damselflies)	From CapeNature's biodiversity occurrence database; target of 11 locations per species used.
Threatened Mammals	From CapeNature's biodiversity occurrence database; target of 11 locations per species used.
Cape Mountain Zebra (*Equus zebra zebra*)	Informed by the Cape Mountain Zebra BMP-S distribution maps, viability assessment and habitat requirements. CapeNature's biodiversity occurrences also included. Target of 10 000 individuals across entire range used, at 100 ha per individual; adjusted proportionally for the Western Cape.
Bontebok (*Damaliscus pygargus pygargus*)	Informed by the Bontebok BMP-S work in progress, including natural and extended distribution range maps. Target of 10 000 individuals used, at an ecological carrying capacity of 22 ha per individual.
Geometric Tortoise (*Psammobates geometricus*)	Informed by the Geometric Tortoise BMP-S work in progress, including field survey data and habitat prioritization. Target of 90% of priority habitat used.
Clanwillian Sandfish (*Labeo seeberi*)	NFEPA fish data informed subcatchment selection, wherein rivers were buffered by 100m. 100% of remaining intact area targeted.
Barrydale Redfin (*Pseudobarbus burchelli*)	NFEPA fish data informed subcatchment selection, wherein rivers were buffered by 100m. 100% of remaining intact area targeted.
African Penguin (*Speniscus demersus*)	All current colonies and potential new nesting sites targeted, though these all occur within existing protected areas or state lands.
Ecological Infrastructure *Providing ecosystem services and supporting ecosystem function*	
Climate Adaptation Corridors	Based on TMF Climate Adaptation Corridors (Pence 2009), edited to exclude all portions within the urban edge. Target of 60% intact (natural or degraded condition).
Ecosystem-based Adaptation Areas	From NBA 2011. Targets not employed, but rather used as a cost surface to direct selection towards areas identified as important for climate change resilience.
Coastal Corridor	Mapped as a 1km coastal buffer zone along all rural (non-urban) sections of coast. Target of 60% intact (natural or degraded condition).
Foredunes	From Integrated Coastal Habitat Map, 2015 version (Harris). Target of 60% intact (natural or degraded condition).
Upland-lowland interface	Mapped as a 500m buffer at the interface between upland and lowland vegetation types. Pattern Target of 20% of remaining natural veld.
Flagship Free-Flowing Rivers	From NFEPA project. All flagship rivers in the province buffered by 100m. 100% of remaining intact area targeted.

Features	Description of data and target setting approach
Ecological Infrastructure *Providing ecosystem services and supporting ecosystem function*	
High Yield and Strategic Water Source Areas	From NFEPA project. 60% of original, entire extent targeted per primary catchment.
Highest Groundwater Recharge Areas	From NFEPA project. 60% of original, entire extent targeted per local municipality.
Riparian Functional Areas (Watercourses)	Combination of the Western Cape's 2013/14 land cover riparian class and the Surveyor General's 1:50 000 river data (buffered by 32m). Target adjusted to 60% of remaining intact areas per freshwater ecoregion.

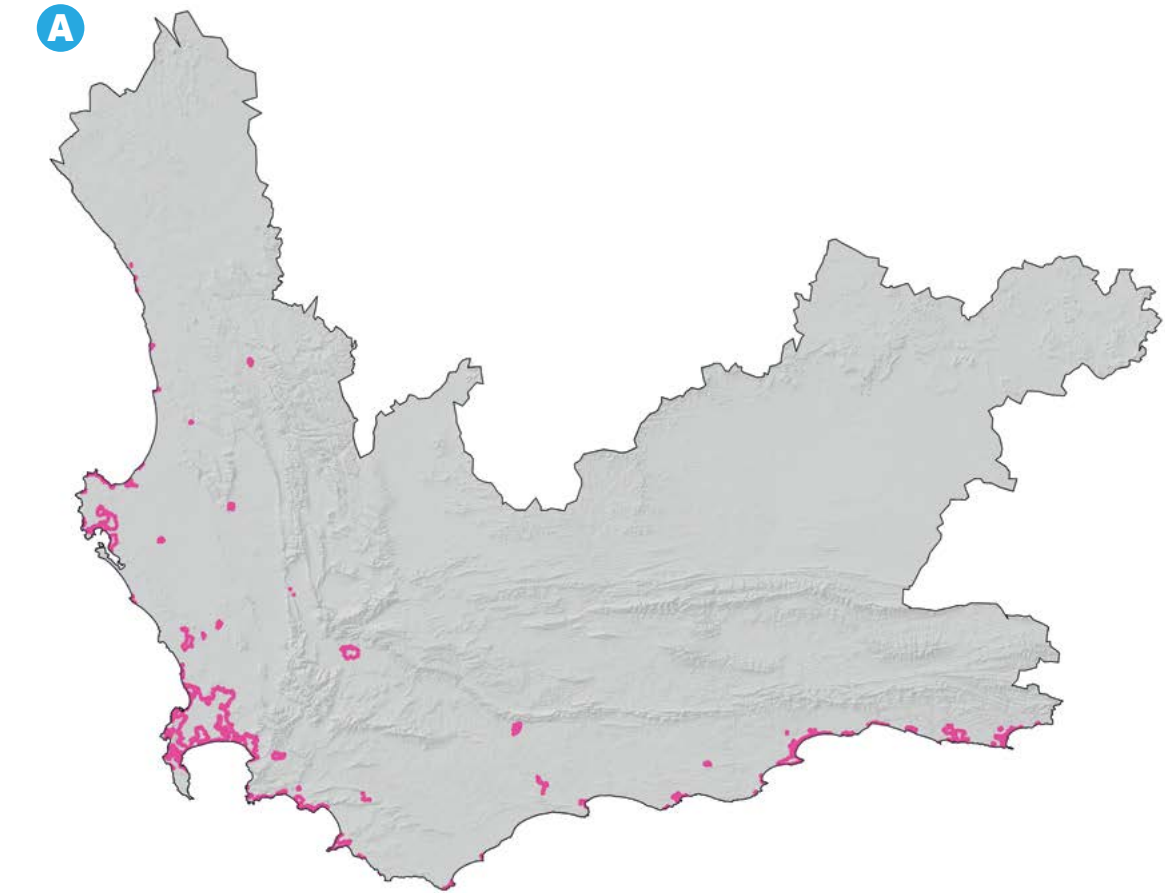
3.2.4 Efficiency and conflict avoidance

Spatial efficiency is a function of the number of iterations run (the more iterations, the higher the likelihood of achieving a near-optimal solution), the cost surface used, and the boundary length modifier.

Three data layers were integrated to generate a 'cost surface' – this is a measure Marxan uses to identify where best to avoid conflict and obtain the most additional value when it selects a set of planning units for achieving all biodiversity targets. It is not a measure of financial value of the land, but rather a measure of where best to meet the national and provincial biodiversity targets whilst avoiding conflict between competing land uses and maximising benefits such as climate change adaptation/climate resilience. The data layers used to calculate efficiency included: a penalty layer representing urban edges, a discount layer representing the WCBF 2014 CBAs, and a discount layer representing features important for climate change adaptation (Figure 3.3).


Etiénne Stanvliet

One of the underlying principles of systematic biodiversity planning is that of (spatial) conflict avoidance – this means that in the identification of CBAs one avoids, wherever possible and without compromising the meeting of targets, areas that may be more at risk of being modified from a natural state, or that may be identified as a priority for other land uses (such as urban development). This principle reduces the likelihood of conflicting land use objectives and increases the likelihood that the identified CBAs will in fact remain intact and contribute to targets in the long term.


A


B

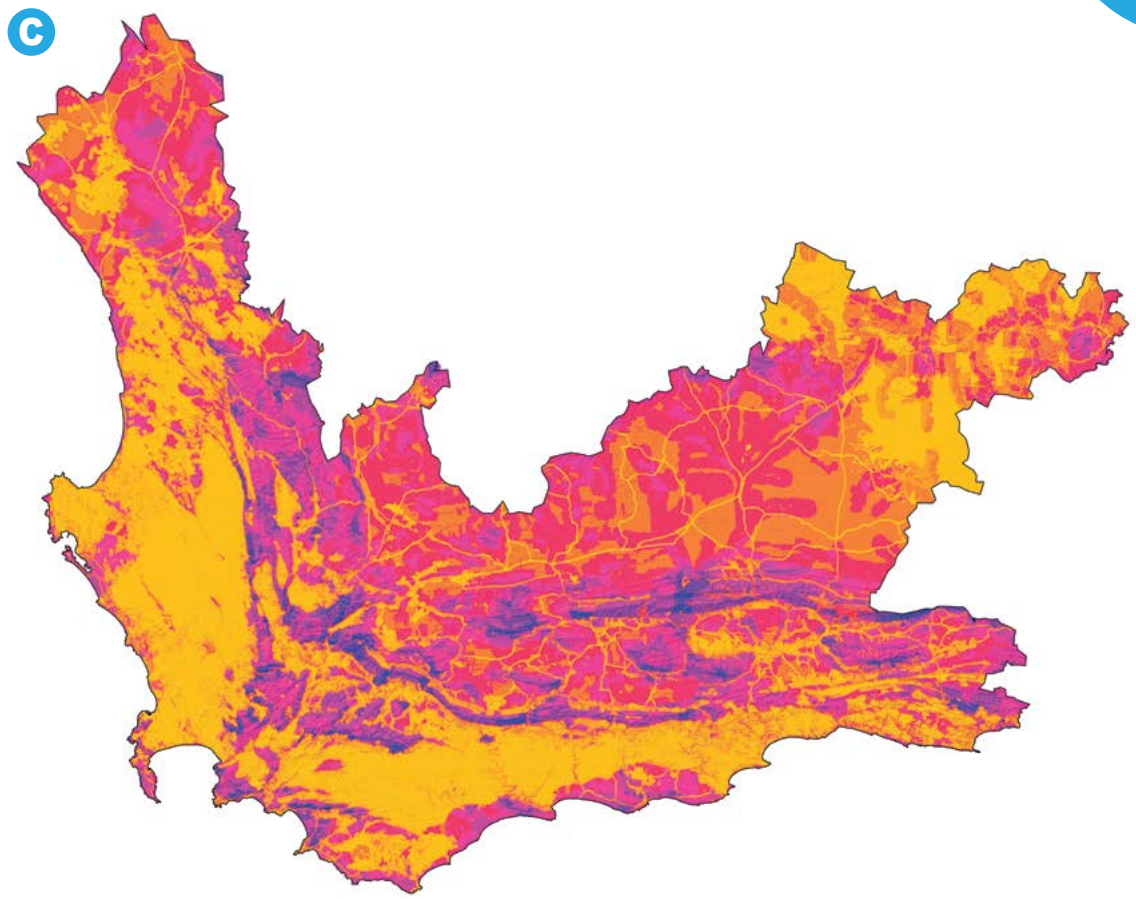


FIGURE 3.3: Three cost surfaces used to promote efficiency and conflict avoidance: (a) urban edges; (b) CBAs from the WCBF 2014; and (c) areas of climate resilience

3.3 Major Advances made in the Development of the Biodiversity Spatial Plan

The 2016 WCBSP reflects important advances in biodiversity planning in the province over the last few years. Importantly, the WCBSP: (1) provides, for the first time, a singular province-wide assessment; (2) utilises more recent and accurate land cover data than previous assessments; (3) gives explicit consideration to ecological infrastructure and climate resilience; (4) responds to the need for greater conflict avoidance with urban areas; (5) identifies depleted ecosystem/environmental stocks; and (6) generally incorporates better quality and more up-to-date biodiversity data. Each of these advances is briefly described below.

3.3.1 Singular, province-wide assessment

DEA and SANBI have recognised the Western Cape Biodiversity Framework (Western Cape Government 2010, 2014b) as the *de facto* provincial biodiversity sector plan for the Western Cape, despite the fact that it was built-up from municipal or other fine-scale biodiversity plans and, thus, had substantial gaps and was not carried out systematically across the entire province. The 2014 update to the WCBF further highlighted the need for revision and amendment of the underlying systematic analyses. Most notably, it concluded that new CBAs needed to be identified to meet target shortfalls of over 86 500 ha across 21 ecosystem types[15], and to better inform land use decision-making in the Western Cape.

15 Technically, 40 ecosystems (of 160 assessed) did not meet targets, but 19 of these are Critically Endangered ecosystems – meaning that they do not have sufficient habitat remaining to meet targets without extensive restoration. These ecosystems can be said to have a 'stock' deficit, whereas the other 21 ecosystems still have 'stock' left to protect.

The 2017 WCBSP provides a singular, province-wide spatial assessment of biodiversity features and ecological infrastructure, identifying the best configuration of areas required to meet targets, and uses the most up-to-date information available.

3.3.2 Recent land cover

Land cover data form the basis of all systematic biodiversity plans by showing where vegetation types and other biodiversity features (e.g. wetlands, threatened species habitat), as well as elements of ecological infrastructure (e.g. climate corridors, foredunes, water source areas) are considered to be in a natural (or near-natural) state versus having been modified to a point beyond which biodiversity function, structure and composition are considered intact. Lands without intact natural vegetation do not contribute to national vegetation targets, nor other representation (biodiversity pattern) targets, though they may contribute to ecological process and functioning.

Prior to 2016, the best-available land cover dataset was the National Land Cover Mosaic (2009)[16], which was 17 years out of date for significant portions of the Western Cape. Given the rapid land use change experienced in many parts of the province, that dataset was providing decision-makers with out-dated, incorrect information. Thus, CapeNature prioritised the acquisition of a new land cover product for the province to inform the WCBSP at appropriate spatial and classification resolution.

A digital, raster-based land cover product, generated from 30m resolution, multi-seasonal Landsat satellite imagery, was delivered to CapeNature in March 2015 (GTI 2015). The product represents a modified version of the 2013–14 South African land cover dataset, including additional sub-class detail requested by CapeNature and pertaining to natural landscape characteristics like water and wetland subdivisions, riparian zone subdivisions, bare ground subdivisions, and vegetation cover density classes. This Western Cape 2013/14 land cover product was then revised to increase the detail of the product, in terms of its representation of the built environment. Geographic masks depicting roads, railways, electrified structures, dams and additional agricultural fields were incorporated into a resampled (10m) version of the original product. The final revised land cover product consists of 122 classes which were used as surrogates for three broad categories of habitat condition: (i) natural to near-natural, (ii) degraded and severely modified, to (iii) completely devoid of natural habitat (Figure 3.4).

3.3.3 Ecological infrastructure and climate change resilience

Ecological infrastructure refers to naturally functioning ecosystems that deliver valuable services to people, such as water and climate regulation, soil formation and disaster risk reduction. It is the nature-based equivalent of built or hard infrastructure, and can be just as important for providing services and underpinning socio-economic development. Ecological infrastructure does this by providing cost effective, long-term solutions to service delivery that can supplement, and sometimes even substitute, built infrastructure solutions. Ecological infrastructure includes healthy mountain catchments, rivers, wetlands, coastal dunes, and nodes and corridors of natural habitat, which together form a network of interconnected structural elements in the landscape.

A spatial representation of how species and ecosystems are supported to adapt to climate change was generated by integrating:

a. areas of climate change resilience;
b. areas of large intact ecosystems;
c. ecological corridors that facilitate the movement of species in response to a changing environment.

16 SANBI's 2009 National Land Cover Mosaic is a patchwork of best-available data. It uses the National Land Cover of 2000 (NLC 2000) as a base layer, supplemented by more recent data where available; for example, DAFF's field crop boundaries (2007), Eskom's SPOT5 building count data (2005/6), and C.A.P.E. Fine-Scale Biodiversity Planning project land cover data (2005/6). The NLC 2000 was, however, the last land cover dataset to completely cover the Western Cape Province. For significant portions of the province best available data therefore reflect conditions on the ground 14 years ago, at 30m resolution and with a final map accuracy of 65.8%. Interestingly, an overall mapping accuracy of 80% is now generally required by the Chief Directorate of National Geospatial Information.

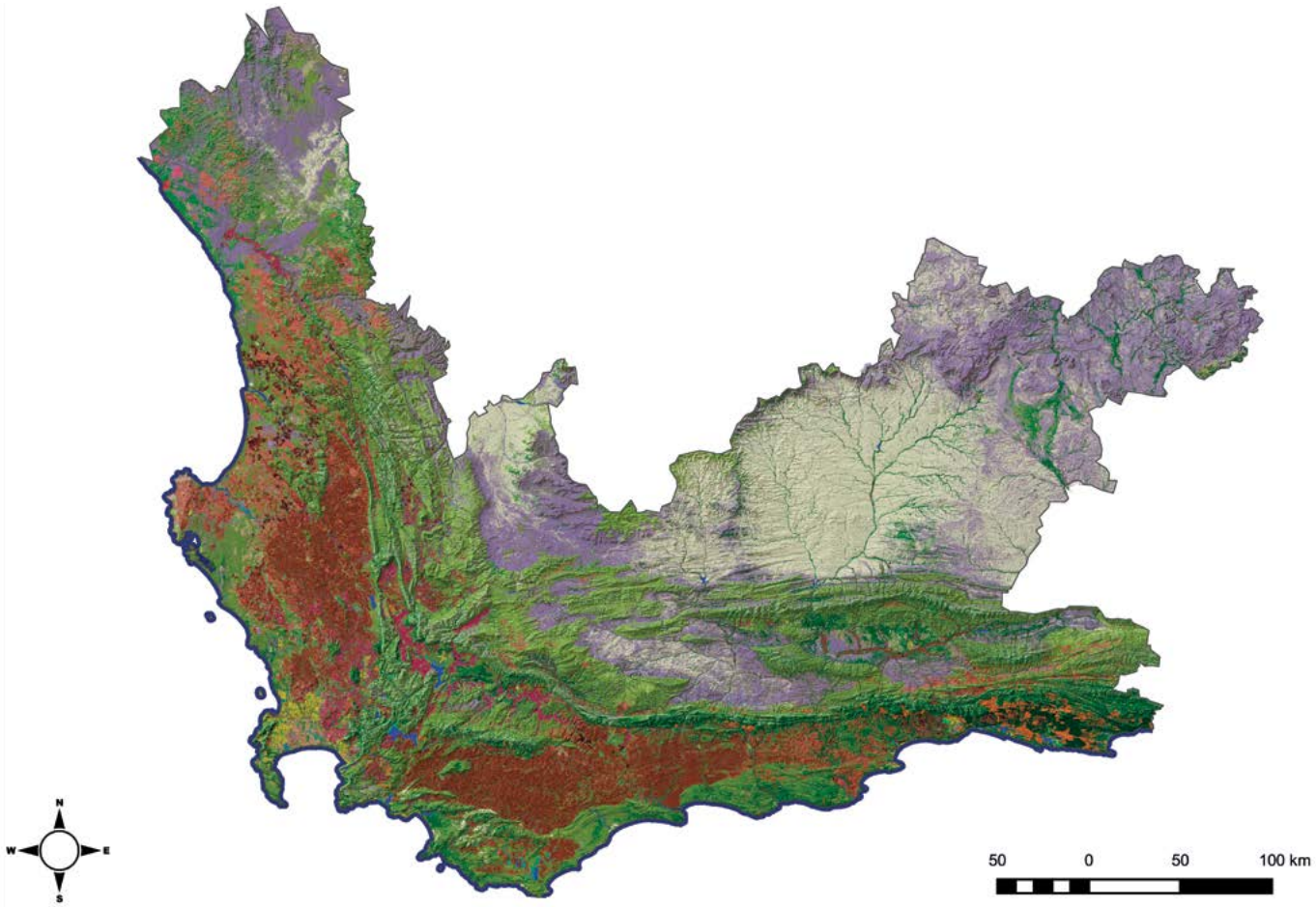


FIGURE 3.4: 2013–2014 Land cover of the Western Cape

These climate change adaptation features were integrated into a single climate change surface that was used as a 'cost' in the spatial analysis. The selection of planning units for inclusion in CBAs and ESAs was thus 'skewed' towards areas that are important to create for climate change adaptation.

3.3.4 Spatial flexibility leading to reduced conflicts with urban land planning

The simulated annealing algorithm within Marxan allows for a huge number of possible solutions (i.e. configurations of planning units) to be appraised. This flexibility gives planners the ability to find solutions which not only satisfy conservation objectives, but help reduce potential conflicts between interests. Thus, in support of the Western Cape Provincial Spatial Development Framework's promotion of urban settlement intensity, integration and consolidation to assist in rectifying inefficient land use patterns, a 'cost' parameter was employed to preferentially select planning units outside of urban areas for meeting provincial conservation targets, where possible. This, however, is not to imply that urban areas are without important biodiversity, but rather to have identified a minimum set in the WCBSP, thereby affording municipalities the opportunity to identify urban biodiversity networks using additional and/or finer-scale data and via a more inclusive process. The CBAs and ESAs identified in the BSP Map should be viewed as a minimum set and form the starting point for more focused urban planning, ultimately aimed at strengthening the resilience of both our natural and built environments.

3.3.5 Identification of depleted ecosystem stocks

South Africa published its first formal System of National Accounts in 1953 to measure how much is produced, consumed and invested in the economy. In recognition of the fact that natural resources drive economies and other human activities around the globe, a System of Environmental Economic Accounting was internationally published in 1993. In South Africa, environmental economic accounts currently exist for energy, minerals and fisheries. There has also recently been a collaborative effort lead by SANBI and Statistics South Africa to pilot a study on ecosystem accounts specifically. Ecosystem accounting is a subset of environmental accounting that measures the state and condition of a country's ecosystems. Thus, ecosystem accounting distinguishes between ecosystem assets and ecosystem services. Our stock of ecosystem assets can be measured and monitored over time, thereby providing useful information about the flow of ecosystem services to people (and the economy).

Although a national programme of work on ecosystem accounts is still being developed, by using the targets established for the WCBSP we can identify specific ecosystem stocks that have been depleted to such a degree that their ability to deliver the services people rely on has been significantly compromised. In the Western Cape, the following ecosystem stocks have been depleted:

- 20 of 160 National Vegetation Types;
- 38 of 331 Wetland Types;
- 5 of 54 Estuarine Functional Areas;
- 3 of 28 Climate Adaptation Corridors;
- 1 of 18 Groundwater Recharge Areas; and
- 7 of 40 Water Source Areas.

3.3.6 More recent and better quality data

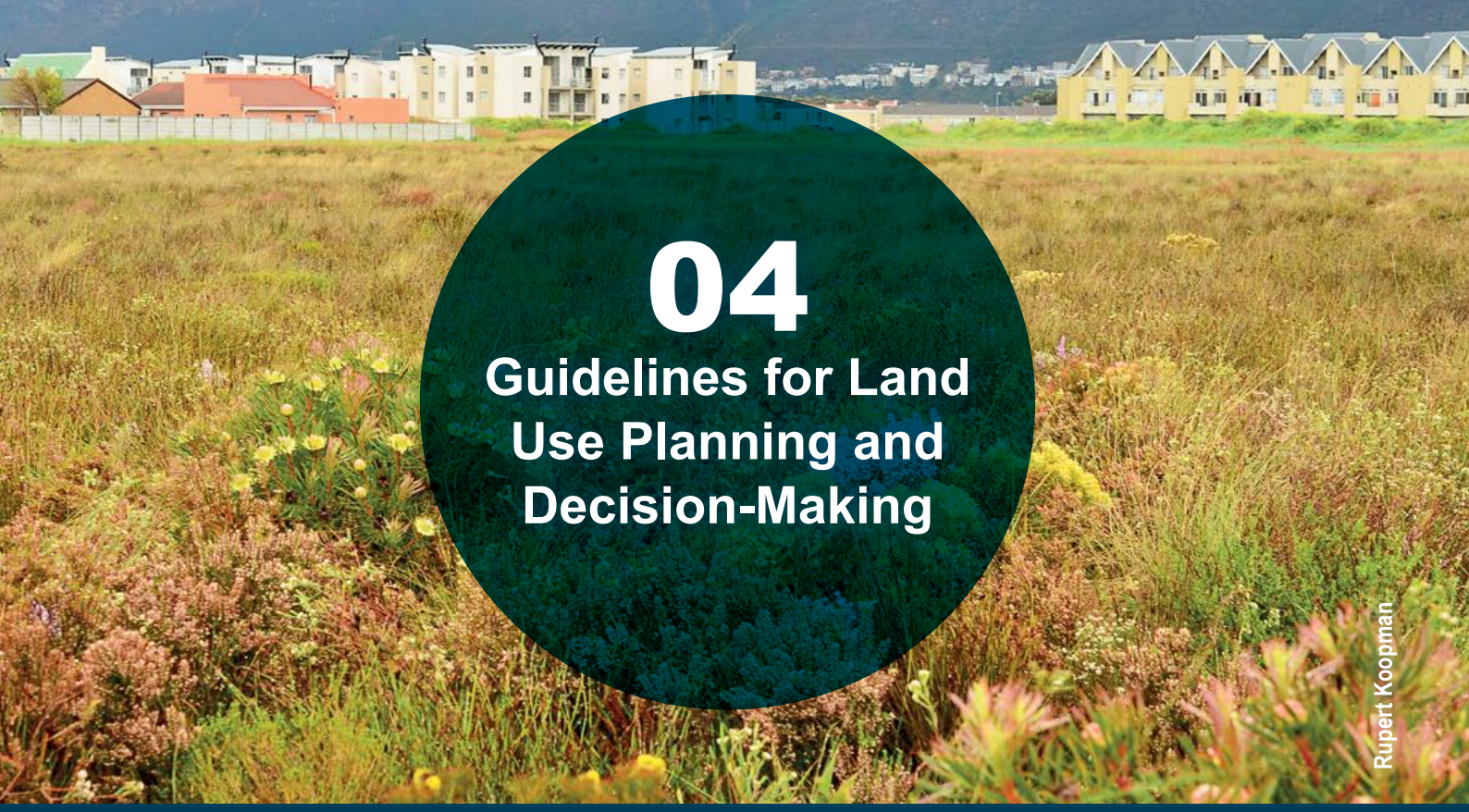
Many spatial data layers were used in the analysis, and considerable effort was made to ensure these were as accurate and up-to-date as possible. The BSP Map, therefore, represents the latest and most scientific approach we have to understanding biodiversity priorities in the Western Cape. However, users of the BSP Map should be aware that only biodiversity information available at the time of conducting the spatial assessment could be fed into the BSP Map.

Importantly, this means that there may be some areas or data sources for which data coverage is not as comprehensive or as recent as for others, and that it may be necessary to verify the BSP Map through site visits.

Most notable among the updated layers used, are the following:

- An updated SA Vegetation Map (version 2012, released by SANBI in 2015), integrated with landward mapped coastal habitat types as per Harris (2015).
- A new river layer that links NFEPA river attributes to finer-scale river polylines than those used by the NFEPA project.
- A new wetland layer that combines the national wetland inventory map (2015) with multi-season, land cover-derived wetlands; adding over 85 000 hectares of wetland features to the provincial inventory when compared to previous datasets.
- A new riparian or watercourse layer that combines all 1:50 000 river lines (buffered by 32m) with all riparian zones (watercourses) identified in the 2013/14 land cover product, resulting in the most comprehensive representation of watercourses ever produced for the province.
- A new indigenous forest layer that combines the DAFF indigenous forest layer with land cover derived natural forest patches.
- An updated Protected Areas layer.
- The most recent (2015) species occurrence data available provincially and/or nationally.


Scott N Ramsay



04 Guidelines for Land Use Planning and Decision-Making

Rupert Koopman

IN THIS CHAPTER:

This chapter provides guidelines for land use planning and decision-making, and for land and resource management using the BSP Map. All the guidelines are informed by the 'Desired Management Objective' for the different categories included in the BSP Map, as well as the relative impact of a land use activity on biodiversity.

The aim of these guidelines is the effective management of biodiversity as required in Section 41(a) of the National Environmental Management: Biodiversity Act and in terms of the National Environmental Management Act. The guidelines are intended to facilitate well-informed, proactive planning and biodiversity-sensitive management of a mosaic of land uses including protection, restoration, production, settlement and subsistence use, in ways that deliver ecological, economic and social benefits.

4.1 Desired Management Objectives of the Biodiversity Spatial Plan Map Categories

Maintaining biodiversity patterns and ecological processes, and the ecosystem services derived from these, requires integrated management over large areas of land. Although a system of well-managed, strategically located protected areas is the most secure long-term strategy for conserving biodiversity, it is generally acknowledged that protected areas alone will never be adequate to conserve a representative sample of biodiversity and maintain ecosystem functioning – it is both impractical and undesirable to secure all biodiversity priority sites through formal protection, as protected areas can be expensive to establish and manage and carry high opportunity costs. It is also difficult to conserve ecological processes in isolated protected areas alone.

There remains a need to safeguard biodiversity beyond the boundaries of protected areas to maintain the integrity of ecosystems across broader landscapes, and for all who live and work in these landscapes to play a part in managing them sustainably. This is the essence of the 'landscape approach' to conservation, in which protected areas are embedded in a matrix of land uses that strives for biodiversity compatibility, and in which biodiversity management objectives are integrated into the plans, decisions and practices of a wide range of land users. These land use guidelines are designed to help achieve this.

4.1.1 Desired Management Objectives

The Desired Management Objective determines the ecological state or condition in which a parcel of land or freshwater feature should be maintained and provides the broad direction for appropriate land or resource-use activities and management practices. Only those land or resource-use activities that are compatible with maintaining the Desired Management Objective should be encouraged. Different categories on the BSP Map have specific management objectives, according to their biodiversity priority (Table 4.1, also see Table 3.2). In broad terms, the biodiversity priority areas need to be maintained in a healthy and functioning condition, whilst those that are less important for biodiversity can be used for a variety of other land uses.

4.2 Land Use Guidelines

The overall purpose of these land use guidelines is to promote the effective management of biodiversity as required in Section 41(a) of the NEM:BA and in terms of the NEMA. The guidelines provide advice on which land uses and activities are most compatible with maintaining the ecological integrity of CBAs and ESAs, and other parts of the landscape, based on the Desired Management Objectives for the land, and the anticipated impact of each land use activity on biodiversity patterns and ecological processes.

The focus of these land use guidelines is on identifying land uses that are compatible with maintaining and achieving biodiversity targets. They should, therefore, be used in conjunction with any other sector-specific guidelines that may be available for the province such as the Mining and Biodiversity Guideline (DEA *et al.* 2013); the Ecosystem Guidelines for Environmental Assessment (Cadman 2016); the Freshwater Ecosystem Priority Areas Implementation Manual (Driver *et al.* 2011) and similar products, as well as Municipal Land Use Management Schemes and other planning tools.

These guidelines are intended for use by planners and decision-makers in multiple sectors at all levels, from landowners and environmental assessment professionals, to district and local municipal officials, to planners and decision-makers in provincial and national government departments. The competent environmental authorities that are responsible for reviewing all EIAs in the Western Cape will require environmental assessment practitioners to incorporate the biodiversity priorities and land use guidelines described in the WCBSP in reports for NEMA authorisation.

Land use guidelines are presented below for terrestrial and freshwater ecosystems. These guidelines are intended primarily to guide planning and decision-making in terrestrial and freshwater CBAs and ESAs on land outside of protected areas. However, brief guidelines are also provided for protected areas. In the sections that follow, general recommendations are given for each category on the BSP Map, relating to Desired Management Objectives and appropriate land uses, and more detailed guidelines are provided in the accompanying tables.

4.2.1 Land use guidelines for terrestrial and aquatic ecosystems

Land use Guidelines for Protected Areas (PAs)

It is beyond the scope and purpose of this Handbook to provide detailed land use guidelines for protected areas. By definition, all protected areas exist primarily for the purpose of securing biodiversity and maintaining the ecological integrity of the landscapes in which they are situated. The NEM:PAA requires that land use and management in each protected area is governed by a formally approved management plan. Such plans identify allowable activities and allocate them to appropriate zones within the protected area. Generally the only developments and activities that will be included for consideration in the protected area management plan would be those that are in support of the goals and objectives of the protected area. Protected area management plans are not purely spatial, but also deal with issues relating to policy and implementation, staffing, performance criteria and budgets, public participation, resource use and other social and economic opportunities.

Where there is an approved protected area management plan in place, this will determine the allowable and prohibited activities within each zone. In general, protected areas should be maintained in a natural or near-natural state, with no loss or degradation of natural habitat. Where there is pre-existing degradation, this should be restored. Where it is necessary to establish or expand infrastructure within a protected area, this should be carried out subject to the provisions of NEMA and the protected area management plan. In general, land uses that are inappropriate in protected areas include any form of mining or prospecting, extensive or intensive grazing of livestock that leads to loss of species diversity, and modification of natural habitat for cultivation, plantation forestry, urban and industrial development. Ecotourism developments in a protected area should be small scale and appropriate with an attempt to minimise the impact on the environment as far as possible.

In ***Protected Environments***, a variety of agriculturally-related land uses are permissible, and may already be in existence when the protected environment is proclaimed. Such land uses may include cultivation of crops, plantation forestry and woodlots, grazing of livestock (or game farming), and various forms of sustainable natural resource use. During the management planning process leading up to the declaration of the protected environment, such land uses should be delineated and zoned separately to the natural ecosystems that are being set aside primarily for protection of biodiversity, using the BSP Map and the land use guidelines as described below.

Land use Guidelines for Terrestrial and Aquatic Critical Biodiversity Areas (CBAs)
A definition for CBAs is provided in Section 3.1.1. The network of CBAs reflected on the BSP Map indicates the most efficient (least land-hungry) selection and classification of land portions requiring safeguarding in order to meet the described targets. Furthermore, wherever possible, the selection has attempted to avoid conflict with other land uses. CBAs need to be maintained in a healthy natural or near-natural state.

Terrestrial CBA categories include:

CBA Forest: An indigenous forest in a largely natural and functional condition that is required to meet biodiversity targets for that type according to the DAFF classification (Western Cape Milkwood Forests, Southern Cape Afrotemperate Forests, and Western Cape Afrotemperate Forests).

CBA Terrestrial: Any other terrestrial habitat in a largely natural and functional condition that is required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure.

Freshwater CBA categories include:

CBA River: A river, or a portion thereof, in a largely natural and functional condition that is required to meet biodiversity targets for river ecosystems and fish species. These include FEPA rivers and additional river reaches now required to meet targets.

CBA Wetland: A wetland in a largely natural and functional condition that is required to meet biodiversity targets for wetland ecosystem types and associated amphibian species. These include FEPA wetlands and additional wetlands now required to meet targets.

CBA Estuary: A portion of an estuary that is required to meet biodiversity targets for that specific estuary (as defined by its functional zone and national status).

Permissible land uses are those that are compatible with maintaining the natural vegetation cover of CBAs in a healthy ecological state, and that do not result in loss or degradation of natural habitat.

Land uses that should not be located in terrestrial CBAs because they cause loss of natural habitat or ecosystem functionality, include:

- Any form of mining or prospecting;
- Conversion of natural habitat for intensive agriculture (cultivation) or plantation forestry;
- Buildings or infrastructure associated with residential, commercial or industrial developments;
- Complete-barrier fencing (i.e. game-proof fences) in CBA corridors;
- Linear infrastructure of any sort that disrupts the connectivity of CBA corridors;
- Extensive or intensive grazing that results in species diversity being lost through selective- or over-grazing.

Each of the subcategories of freshwater CBA has fairly unique land use guidelines and planning requirements. Land uses that may have negative impacts on river, estuarine and wetland systems are summarised below:

- *Water extraction:* cumulative reduction of river flow.
- *Mining*: destruction of water table, acid mine drainage, toxic ground-water discharge.
- *High water-demand cultivation (e.g. vineyards, orchards, horticulture, irrigated pivot circles):* lowers water table, causes stream flow reduction and complex soil changes.
- *Industrial-scale agriculture:* causes widespread changes to soil and vegetation cover, with major impacts on soil erosion, infiltration of rainfall, water-table recharge and sedimentation of rivers. Use of pesticides is of high concern and should be banned in the vicinity of CBA freshwater areas.
- *Hard paving and built structures (urban development):* reduced infiltration and water-table recharge, enhanced flooding, erosion and sedimentation of riverbeds, pollution and changes to overall river ecology.
- *Point-source pollution from sewage, industrial and mining discharges*: toxic to biodiversity and humans, damages ecosystem health.
- *Dams and weirs:* changes downstream hydrology including flow characteristics, water temperature, turbidity and dissolved nutrients, and provide a physical barrier to fish.
- *Overgrazing:* causes widespread changes to soil and vegetation cover, and is a potential cause of soil erosion.
- *Non-point-source pollution (e.g. groundwater and seepage):* from dumps (mine, industrial and rubbish), surface runoff (agricultural, mine, industrial and urban), and irrigation seepage can cause changes in soil chemistry and be toxic to plants, animals and humans.
- *Engineering/construction/earth moving*: causes accelerated soil erosion, turbidity (suspended solids) and sedimentation.
- *Structures such as bridges, causeways (also weirs and dams)*: can change the natural erosion and sedimentation characteristics of a river, causing local and downstream channel modification.

The CBA categories also include a CBA 2 (degraded) category which are areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. These areas should be rehabilitated and only low-impact, biodiversity-sensitive land uses are appropriate.

Guidelines for locating land uses within CBAs are provided in Table 4.1.

TABLE 4.1: Land Use Guidelines for Protected Areas and Critical Biodiversity Areas

Map category	Desired management objective	General guidelines	Specific guidelines
Protected Areas	Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. A benchmark for biodiversity.	• All operational aspects of managing these areas must be subject to their main purpose, which is to protect and maintain biodiversity and ecological integrity, and should be governed by a formally approved management plan including land use activities that support the primary function of these areas as sites for biodiversity conservation. • The management plan must identify allowable activities, which should be consistent at least with the CBA Irreplaceable category; the location of these allowable activities should be captured in a zonation plan in the management plan • Activities relating to the construction of roads, administrative or tourism infrastructure and services (such as water reticulation systems, power lines, etc.) that are required to support the primary function of the protected area and its allowable activities, are subject to NEMA authorisation and the protected area management plan. • In the case of **Protected Environments,** a variety of agricultural land uses may be allowed, such as livestock grazing, plantation forestry and limited cultivation. The location of these land use activities must be informed by the BSP Map, and should be specified in the zonation plan in the management plan for the protected environment. All areas of natural habitat that are zoned for conservation use, should be subject to implementation of the land use guidelines for protected areas, CBAs, and ESAs. • Mountain Catchment Areas are also included in this category, however unlike the other categories, there is no requirement for a management plan which would guide allowable land uses and activities. Therefore, the land use guideline should be aligned with that of Critical Biodiversity Areas, with the primary intention to ensure the steady supply of good quality water to downstream areas.	
Critical Biodiversity Area 1: Terrestrial & Forest	Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.	• Biodiversity loss and land use change in CBAs should not be permitted. Unauthorized land use change or degradation by neglect or ignorance must be monitored as a matter of priority. • Where appropriate and in accordance with the Protected Area Expansion Strategy (and where capacity exists), these areas should be incorporated into the formal Protected Area system through biodiversity stewardship agreements (contract Nature Reserves or Protected Environments). • Ideally, conservation management activities should be the primary land use in all irreplaceable areas, OR they should at least be managed in ways that have no negative impact on species, ecosystems or ecosystem services.	• Ideally, development should be avoided in these areas. If they cannot be avoided it must be shown that the mitigation hierarchy has been applied if there is a proposal within a CBA. If the impact cannot be avoided or reduced to a residual low significance, a biodiversity offset may be considered as a last resort. However, a biodiversity offset should not be offered upfront and will be considered on a case by case basis. • A specialist study must form part of the Scoping and EIA process for all land use applications in these areas, using the services of an experienced and locally knowledgeable biodiversity expert who is registered with SACNASP.

Map category	Desired management objective	General guidelines	Specific guidelines
Critical Biodiversity Area 1: Terrestrial & Forest		• Extensive (low-intensity) livestock or game ranching, if well-managed, may be compatible with the desired management objectives for these areas. These land uses are acceptable if they take into account the specific biodiversity features (e.g. rare species or vegetation remnants) and vulnerabilities (e.g. infestation by invasive alien plants) at each site, if they comply with recommended stocking rates and if any associated infrastructure (required to support the ranching activities) is kept to low levels. • Conservation efforts should focus on conserving Species of Conservation Concern and populations of keystone species and species responsible for pollination and seed dispersal.	• Applications for land use of any kind should be referred to the Land Use and Conservation Planning team at CapeNature for comment. • Degraded areas included in the land parcel, but not the land use proposal, should be restored to natural ecosystem functioning where possible. • Alien clearing should be given high priority.
Map category	**Desired management objective**	**General guidelines**	**Specific guidelines**
Critical Biodiversity Area 1: Aquatic	Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.	• Freshwater CBAs should be maintained in good ecological condition, and those that are degraded should ideally be rehabilitated to a good condition. • Land use practices or activities that will lead to deterioration in the current condition of a freshwater CBA, or that will make rehabilitation difficult, are not acceptable. • Any proposed land use change must be subject to an EIA as it is likely to impact on the ecological drivers of the river or wetland ecosystem and can, potentially, alter its functioning or lead to loss of species. • Maintain the riparian vegetation and a buffer from other land uses along watercourses and implement rehabilitation measures where there is erosion or other degradation present. • Specialist studies by a freshwater ecologist should be conducted if there is a watercourse that is likely to be affected.	CBA Rivers, Wetlands and Estuaries: • There is no flexibility in land use options in this category. • Any activities that may impact on CBA rivers, wetlands or estuaries, even upstream or in sub-catchments, need to be avoided, or impacts mitigated if they cannot be avoided. • If the current ecological condition is good (either natural and unmodified, or largely natural with only small change in habitats and biota), then this condition needs to be maintained. • If the current ecological condition is fair to poor (i.e. moderately to severely degraded with significant loss of natural habitat, biota and ecosystem functions), then this needs to be improved through rehabilitation measures. Any further loss of area or ecological condition must be avoided. • The hydrological regime and water quality of a river, wetland or estuary must be adequate to maintain the ecosystem in a desired or attainable condition. • All aquatic ecosystems must be appropriately buffered. Buffers must be provided for, such that they: – are adequate for the protection of the ecosystem from the pressures identified above; – maintain the ecosystem in a desired or attainable ecological condition; – allow for future rehabilitation or restoration.

Map category	Desired management objective	General guidelines	Specific guidelines
Critical Biodiversity Area 1: Aquatic			• Human activities that will impact directly (e.g. encroachment) or indirectly (e.g. diffuse pollution) on a river, wetland or open waterbody, and/or its buffer, must be assessed by a suitably qualified and experienced specialist, and the ecosystems ground-truthed as part of any land use change application, environmental assessment or licencing process.
Map category	**Desired management objective**	**General guidelines**	**Specific guidelines**
Critical Biodiversity Area 2: (Degraded)	Maintain in a functional, natural or near-natural state, with no further loss of natural habitat. These areas should be rehabilitated.	• Acceptable land uses are those that are least harmful to biodiversity, such as conservation management, or extensive livestock or game farming (see below). Large-scale cultivation, mining and urban or industrial development are not appropriate. • Extensive (widespread, low-intensity) livestock and game ranching, if well-managed (see above), is compatible with the desired management objectives for these areas. • Implementation of habitat restoration measures to restore the habitat to a better condition.	• If small-scale land use change is unavoidable, it must be located and designed to be as biodiversity-sensitive as possible. • A specialist study must be part of the scoping and EIA process for all land use applications in these areas, using the services of an experienced and locally knowledgeable biodiversity expert registered with SACNASP. • Provision for biodiversity offsets in exchange for biodiversity loss should only be considered as a last resort and at a ratio consistent with national policy. • Should be targeted as high priority areas for rehabilitation and restoration including natural resource management (NRM) projects e.g. Working for Water as well as landowner driven initiatives.

Land use Guidelines for Terrestrial and Aquatic Ecological Support Areas

ESAs are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs, and deliver important ecosystem services. They facilitate landscape connectivity, promote resilience to climate change, and buffer elements of the landscape including protected areas and sites that are important for the survival of individual species.

ESA 1: Foredunes: The foremost frontal dune zone of a dune system, that plays an essential role in providing physical buffering against sea storm surges and other potential climate change-related impacts, but was not selected for meeting targets.

ESA 1: Forest: Indigenous forest habitat not selected for meeting targets, but which is still protected under the National Forests Act (No. 84 of 1998) and may support the functioning of PAs or CBAs.

ESA 1: Climate Change Adaptation Corridor: A climate adaptation corridor not selected for meeting targets, but which plays an important role in landscape connectivity, as well as supporting the functioning of PAs or CBAs. The purpose of ecological corridors is to provide intact pathways for long-term biological movement. Landscape-scale corridors represent the best option for promoting resilience to climate change and the persistence of biodiversity as they provide pathways for the movement of plants and animals in response to environmental change. They also support the natural movement of species between populations to ensure population viability. Landscape corridors are aligned with areas that have maximum amounts of remaining natural habitat. Local corridors are fine-scale corridors that contribute to connectivity between climate change refugia. They represent alternative pathways for movement of species, and thus lessen impacts on critical linkages and landscape-scale corridors, and provide networks that are more robust to disturbance.

ESA 1: Coastal Resource Protection: Areas along the coastline where changes in land use may affect the ecological functioning and/or the resilience of the coast to withstand impacts that may arise as the result of climate change and impact on coastal processes e.g. erosion and deposition, as well as supporting the functioning of PAs or CBAs.

ESA 1: Endangered Ecosystem: An area of an Endangered Ecosystem not selected for meeting targets, but which is still a (listed) Threatened Ecosystem and plays an important role in supporting the functioning of PAs or CBAs.

ESA 1: River: A river not selected for meeting targets, but which is still a protected resource, is essential for delivering ecosystem services, and may support the functioning of PAs or CBAs.

ESA 1: Estuary: An estuary not selected for meeting targets, but which is still a protected resource, is essential for delivering ecosystem services, and may support the functioning of PAs or CBAs.

ESA 1: Wetland: A wetland not selected for meeting targets, but which is still a protected resource, is essential for delivering ecosystem services, and may support the functioning of PAs or CBAs.

ESA 1: Watercourse Protection: A watercourse not selected for meeting targets, but which is still a protected resource, is essential for delivering ecosystem services, and may support the functioning of PAs or CBAs.

ESA 1: Water Source Protection: A water source area not selected for meeting targets, but which is essential for delivering ecosystem services, and may support the functioning of PAs or CBAs. Consists of important catchment areas.

ESA 1: Water Recharge Protection: A water recharge area not selected for meeting targets, but which is essential for delivering ecosystem services, and may support the functioning of PAs or CBAs. Consists of areas overlying aquifers, fulfilling the role of feeding the aquifers.

ESA 2: These areas may be degraded but still play an important role in supporting the functioning of PAs or CBAs, and are essential for delivering ecosystem services. Plantations may be included in this category. These areas should be restored and/or managed to minimise impact on ecological infrastructure functioning; especially soil and water-related services, and to allow for faunal movement.

Permissible land uses: There is more flexibility in terms of options for compatible land uses in ESAs than there is in CBAs. However, ESAs do need to remain ecologically functional, which means that they need to be maintained in at least a near-natural state, although some loss of biodiversity pattern through a variety of land uses is acceptable.

Broad land use guidelines for working within ESAs are also provided in Table 4.2 (following on Cadman 2016).

Land use guidelines for Terrestrial Other Natural Areas

Other Natural Areas (ONAs) are not required to meet biodiversity targets, and are therefore not identified as a priority in the WCBSP. They do, however, retain much of their natural character. The biodiversity in these non-priority landscapes may still be of value and contribute to maintenance of viable species populations and natural ecosystem functioning and ONAs may provide essential ecological infrastructure and ecosystem services.

Permissible land uses: ONAs offer the greatest flexibility in terms of management objectives and permissible land uses, and are generally recommended as the sites for higher-impact land uses. However, because ONAs may still have significant ecological, aesthetic and social value, they should not be regarded as unnecessary or areas where 'anything goes.' Planners are still required to give due consideration to assessing environmental factors, socio-economic efficiency, aesthetics and impacts on the sense-of-place in making decisions about the location of land uses in these areas. Environmental authorisation may still be required for high-impact land uses in terms of the listed activities in the EIA regulations, and other relevant legislation.

Land use Guidelines for Terrestrial Severely Modified/No Natural Remaining Areas

No Natural Remaining or Severely Modified Areas are those in which significant or complete loss of natural habitat and ecological functioning has taken place due to activities such as ploughing, hardening of surfaces, mining, cultivation and other activities that modify natural habitat. Even so, they may include small remnants of natural habitat such as the patches or strips of natural habitat that survive between cultivated lands, along river-lines and ridges and in open spaces in towns. These disconnected remnants are often biologically impoverished, highly vulnerable to damage and have limited likelihood of being able to persist, but may contain residual biodiversity value or may provide ecological infrastructure or certain ecosystem services.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Old lands or 'old fields' are those areas that were used for cultivation or mining in the past (within the last 80 years), but are no longer used for these purposes and have been left to re-vegetate. These 'old lands' are areas where biodiversity pattern and ecological function have been seriously compromised in the past, but they may still play an important role in the provision of ecosystem services, or may provide important habitats for certain animal species. For example, old lands can provide important feeding grounds for birds such as blue cranes, and disused mine shafts can provide suitable habitats for certain bats species. Although dams are not natural water bodies, they may still have a recharge effect on wetlands, groundwater and river systems and may support river- or water-dependent fauna and flora, such as water birds and wetland vegetation. For this reason it is important to manage them carefully and avoid negative impacts on water quantity and quality in particular.

Permissible land uses: These areas are preferred for intensive land uses such as the construction of settlements, industrial development and other land uses that have a high impact. These land uses should still be located and managed in ways that maintain any residual ecological functionality, and that does not impact negatively on species for which these modified sites may be important. In some cases restoration may be advisable.

TABLE 4.2: Land use guidelines for Ecological Support Areas, Other Natural Areas and No Natural Remaining

Map category	General guidelines	Specific Guidelines
Ecological Support Areas	The desired management objective for all ESAs is to maintain the land in a near-natural and ecologically functional state, even if some loss of ecosystem composition or structure takes place.	
Subcategories		
ESA: Foredune	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• No construction (or other unnatural disturbance) should be allowed in sand movement corridors, on foredunes or in mobile dunefields. All infrastructure should be placed inland of the secondary dunes, within the coastal management lines determined by DEA&DP or the Municipality, or contained in any current Coastal Management Plans. • Locate infrastructure and buildings so as to avoid damage from coastal processes and, where possible, to avoid the need for physical defences against potential damage resulting from natural coastal processes. • Municipal planning decisions should include phased retreat of infrastructure along the coast, where possible. • The use of off-road vehicles (ORVs) on dunes and beaches should be strictly regulated, including a strictly-enforced ban (that includes management vehicles) on driving in dune systems and above the high water mark on beaches. • Access to the beach should be regulated by establishing designated access points. • Avoid stabilization (e.g. planting) of naturally mobile dune systems as far as possible, unless there is a threat to property in which case it should be in accordance with a NEMA authorisation.
ESA: Forest	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• Unplanned fires must be prevented. • Alien clearing should be given priority. • Regulate harvesting of forest resources. • Avoid transformation for development, apart from infrastructure to support forestry land use.
ESA: Climate Change Adaptation Corridor	Maintain ecological functionality in support of biodiversity connectivity by retaining the existing natural vegetation cover in a healthy ecological state, and restore 'critical-linkages' where necessary.	• Restoration of corridors is important, particularly in terms of the Working for Water programs, in particular to maintain continuity of functional habitat. • The impact of land use proposals on the functionality of ecological corridors must be assessed by the relevant biodiversity specialist as part of the NEMA process. • Impenetrable fences that restrict animal movement should be discouraged.
ESA: Coastal Resource Protection	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• Coastal Management Lines must be determined and adhered to. From an ecological perspective, the delineation of coastal management lines needs to take into account, as a minimum: – the need to protect infrastructure from coastal processes by allowing for: absorption of the impacts of severe storm sequences, shoreline movement, global sea level rise and increased storm surges, the fluctuation of natural coastal processes, and any combination of these factors. – the ecological requirements for maintaining biodiversity pattern and ecosystem processes, in combination with factors such as landscape, seascape, visual amenity, indigenous and cultural heritage, public access, recreation, and safety to lives and property. – the need to treat the coast as an indivisible system. – the need to establish and maintain a buffer of contiguous indigenous vegetation between the inland boundary of the youngest fixed dune trough and the seaward boundary of any impacting land use activity (the exact set-back will depend on the biophysical characteristics and requirements of the area, and the type and scale of the infrastructural development).
ESA: Endangered Ecosystem	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• Ideally these areas should be avoided for any activity resulting in habitat loss. If they cannot be avoided it must be shown that the mitigation hierarchy has been applied.

Map category	General guidelines	Specific Guidelines
ESA: River	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• The ecological importance of aquatic ESAs may not necessarily be for the conservation or maintenance of biodiversity pattern and/or ecological processes, but may be in terms of functional value. For example, inland aquatic ecosystems generally provide water retention capacity, which is an important function in the catchment, especially in the context of the seasonally dry nature of the Fynbos Biome. • The hydrological regime and water quality of a river, wetland or open waterbody must be adequate to maintain the ecosystem in a desired or attainable condition. • All aquatic ecosystems must be appropriately buffered. Buffers must be provided for, such that they: – are adequate for the protection of the ecosystem from the pressures identified above; – maintain the ecosystem in a desired or attainable ecological condition; – allow for future rehabilitation or restoration. • Human activities that will impact directly (e.g. encroachment) or indirectly (e.g. diffuse pollution) on a river, wetland or open waterbody, and/or its buffer, must be assessed by a suitably qualified and experienced specialist, and the ecosystems ground-truthed as part of any land use change application, environmental assessment or licencing process.
ESA: Estuary	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• Maintain freshwater flow regimes that are as close to natural as possible; it is of the utmost importance to maintain low (dry season) flows, seasonality and flood frequency. • Maintain the minimum freshwater flows (i.e. the Ecological Reserve) required for maintenance of estuary health and protection of estuarine biodiversity. • Maintain and monitor water quality, particularly the quality of freshwater inputs. • Maintain mouth dynamics (opening and closure) that are as close to natural as possible. Any form of artificial mouth management should form part of the holistic estuary management plan. • Ensure that harvesting or utilisation of living estuarine resources (flora and fauna) is kept within sustainable limits. • Encourage land use practices that minimise loss of natural habitat and erosion, and avoid the introduction of habitat-altering invasive alien species of plants and animals (such as large predatory fish). Where stands of invasive alien vegetation are present around the estuary or in its catchment, implement appropriate clearance programmes.
ESA: Wetland	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• All wetlands are protected under the National Water Act (Act 36 of 1998). • Delineate all wetlands within 500m of a land use activity as per DWAF (2008), and apply for a Water Use Licence. • Conduct a buffer determination assessment around all wetlands, regardless of ecological condition or ecosystem threat status. Refer to the NFEPA Implementation Manual for specific guidelines (for example, mining should not take place within 1 km of the boundary of the buffer around a wetland.
ESA: Watercourse Protection	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• All aquatic ecosystems must be appropriately buffered. Buffers must be provided for, such that they: – are adequate for the protection of the ecosystem from the pressures identified above; – maintain the ecosystem in a desired or attainable ecological condition; – allow for future rehabilitation or restoration.

Map category	General guidelines	Specific Guidelines
ESA: Water Source Protection	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• Mountain Catchment Areas (in terms of function, not in terms of declared MCAs in terms of the Mountain Catchment Areas Act) should ensure that land use activities allow for the continued provision and natural slow release of water flowing into river catchments. Hard surfaces should not be permitted and should be restricted to essential infrastructure to support catchment areas. • Water Source Protection Areas tend to be favoured for plantations and the application of best-practice management is encouraged. • Mining places the delivery of good quality water in adequate quantities at risk, and any cumulative impact of mines needs to be assessed and considered when processing mining applications. • These areas should be targeted for rehabilitation and restoration activities that support the release of water from these areas, in particular clearing of invasive alien trees and remediation of erosion. The clearing of invasive alien plants from drainage lines and wetlands within these areas must be a provincial priority. Restoration of wetlands and degraded areas within these catchments is encouraged. • Substantial buffers should be established around streams and wetlands in catchments within these areas. • Cultivation should not be permitted in these areas.
ESA: Water Recharge Protection	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	• These areas need to be managed to ensure no further deterioration of the sub-catchment in which they are located. • Flow rates in streams should be maintained by managing land use practices, especially agriculture to ensure that the majority of the catchment remains in a natural state. • Hardened surfaces within water recharge protection areas must be minimised. Stormwater management plans must be in place to manage run-off from any developments to ensure that the groundwater resources are not compromised. • Activities which result in the pollution or contamination of groundwater must be prevented. • Extraction of groundwater resources must be closely monitored and controlled by the competent authority.
Ecological Support Area 2	Restore and/or manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services.	• These are areas which may already have some form of development (cultivation, mining or even buildings and infrastructure) but which should be providing ecosystem services. Where possible the current land uses should be withdrawn and rehabilitation should be undertaken. • Best practice should apply in areas where land uses other than conservation are present e.g. agriculture. • These areas should be targeted for habitat rehabilitation and restoration activities e.g. alien clearing.
Other Natural Areas	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.	• These areas have the greatest flexibility in terms of management objectives and permissible land uses. • Where possible, avoid modifying any remaining natural habitat by locating land uses, including cultivation and plantations, in already-modified areas. • Authorisation may be required for high-impact land uses (such as intensive industry or urban development) and standard application of EIA regulations and other planning procedures is required. Note: These areas may still contain species of conservation concern but either have not yet been surveyed, or the data was not available for incorporation into the WCBSP. The presence or absence of species of conservation concern should always be established through site visits before proceeding with a land use change. Recommendations of an appropriately qualified specialist must be followed in this regard.

Map category	General guidelines	Specific Guidelines
No Natural Remaining	Manage land use in a biodiversity-friendly manner, aiming to maximise ecological functionality. In old lands, stabilise ecosystems and manage them to restore ecological functionality, particularly soil carbon and water-related functionality, using indigenous plant cover. Old lands should be burnt and grazed appropriately.	• Areas with no natural habitat remaining are preferred sites for higher-impact land uses, and new projects should be located in these areas before modifying any remaining natural habitat. • Restoration and re-vegetation should be prioritised where heavily modified areas occur close to land of high biodiversity value, or are located such that they could potentially serve useful ecological connectivity functions (such as in ecological corridors). • For individual parcels of land identified as having specific actual or potential biodiversity values, develop incentives to restore lost biodiversity and connectivity. • When locating land uses in these modified areas, consider the off-site impacts they may have on neighbouring areas of natural habitat, especially if these are of high biodiversity value. For example, controlling use of pesticides in modified areas, because of the impacts on neighbouring areas of natural habitat. • Encourage landowners and developers to use indigenous plants, especially trees, where aesthetic or functional options exist.

4.3 Using the Biodiversity Spatial Plan in developing Integrated Development Plans

The Integrated Development Plan (IDP) reflects multi-sectoral planning at municipal level. It must comply with the 'Environmental Right' of the Constitution (Section 24) and the NEMA principles. In order to ensure environmental sustainability, it usually includes an Environmental Sector Plan (or Integrated Environmental Management Programme). The Environmental Sector Plan can comprise a range of environmental management tools to promote sustainability and compliance with the various pieces of legislation. These tools are to address many environmental issues such as control of waste water discharge, air pollution, biodiversity protection, etc.

The BSP Map should form the spatial focus for biodiversity protection projects of all Environmental Sector Plans in the Western Cape, to be identified in the IDP project phase.

4.3.1 The Environmental Sector Plan of the Integrated Development Plan

The Environmental Sector Plan of the IDP comprises projects or programmes that aim at achieving environmental sustainability. These can be mechanisms or tools for ensuring the protection of CBAs and ESAs.

The following are examples of projects or programmes which could be implemented through the Environmental Sector Plan component of the IDP to assist with biodiversity protection (this is not an exhaustive list of all potential projects).

4.3.1.1 State of the Environment Reporting

A key mechanism in monitoring the state of biodiversity in a municipality is a State of the Environment Report. The State of the Environment Report uses indicators to monitor improvement or deterioration of environmental conditions, and provides recommendations for areas of concern. The WCBSP can be used to inform the State of the Environment Report as it provides information on the extent of CBA and ESA. Municipalities are therefore encouraged to record the conservation or loss of CBA and ESA.

Other indicators could include:

- protection levels of CBA and ESA (how many hectares / what percentage are formally protected);
- how effectively CBA and ESA are protected in the municipal zoning scheme (i.e. what portion of CBA and ESA are appropriately zoned);
- the extent (in hectares) of invasive alien plant species clearing; and
- the number or proportion of threatened or extinct species, and threatened ecosystems listed by NEM:BA.

4.3.1.2 An Environmental Management Plan for municipal land

The management of natural resources is a cross-cutting responsibility, requiring the collaboration of a range of agencies and departments (e.g. SANParks, CapeNature, DWS and DoA). They should assist municipalities in developing management plans for all municipality-owned land included in CBA and ESA categories. In addition, projects with biodiversity benefits (e.g. invasive alien plant clearing, ecotourism, sustainable harvesting of medicinal plants) can be identified and implemented as part of IDP and LED processes.

Municipalities are now required to compile and implement alien invasive management plans for all municipal-owned land in terms of the NEM:BA Alien and Invasive Species Regulations (2014). The WCBSP can be used to inform the prioritisation process for these plans.

4.3.1.3 Area Wide Planning

The WCBSP can be used as the biodiversity informant for Area Wide Plans as implemented by the Western Cape DoA in which existing farm lands, potential agricultural expansion areas and important natural areas are mapped to identify possible conflict areas and to ensure biodiversity is protected for sustainable agricultural development. Municipalities which have a strong agricultural economy could request Area Wide Plans as part of their agricultural sector plans. The agricultural sector plans should also take the WCBSP into account, once these are undertaken. Area Wide Plans that are informed by the BSP Map can provide the basis for rural EMFs that introduce more predictability and sustainability assurance to agricultural land use planning.

4.3.1.4 Protecting Biodiversity through Stewardship (see Section 2.8)

The NEM:PAA provides for any land, including private, communal or municipal land, to be declared a formal protected area, and allows for co-management of such a protected area by the landowner(s) or any suitable person or organisation. CapeNature's Stewardship Programmes work with private landowners and municipalities to secure CBA and ESA as formal protected areas, namely Contract Nature Reserves or Protected Environments; or through other suitable stewardship options. Landowers are also offered the option of Contractual National Parks by SANParks. Significant benefits and incentives are available to landowners of formal protected areas. Municipalities should facilitate stewardship in CBA and ESA through *inter alia* rates exclusions.

All formal protected areas are eligible for rates exclusions in terms of the Municipal Property Rates Act. The National Biodiversity Framework promotes the establishment and strengthening of provincial stewardship programmes and identifies local authorities as one of the lead agents. CBA and ESA are an important focus for stewardship programmes.

4.3.1.5 Co-operative management measures for protecting biodiversity

Catchment Management Agencies (CMAs): The delegation of water resource management and protection from central government to catchment level is being achieved through the establishment of CMAs. These agencies comprise all relevant water users. According to the National Biodiversity Framework of 2008, the WCBSP should be incorporated into the work of CMAs. In the Western Cape, the Breede Gouritz Catchment Management Agency (BGCMA) is currently operational (previously BOCMA – Breede Overberg CMA), with the setting up of the Berg CMA and Olifants CMA underway.

Fire Protection Associations (FPAs): FPAs are voluntary associations that may be formed by landowners to prevent, predict, manage and extinguish veld fires under the National Veld and Forest Fire Act (Act No. 101 of 1998). Municipalities are obliged to be members and should encourage landowners to join their local FPA. The WCBSP can be used to inform Fire Action Plans (visit www.firewisesa.org.za).

Co-operative Governance: Conservation agencies such as CapeNature, SANParks and provincial authorities (DWS, DEA, DoA and DEA&DP), together with municipalities, should investigate possible structures for this purpose. Such co-operative management measures are promoted by Section 4.2.6 of the National Biodiversity Framework of 2008; and the NEMA principle which states that there must be intergovernmental coordination and organisation of policies, legislation and actions relating to the environment. The WCBSP and guidelines serve as a common reference point for co-operative governance.

4.3.1.6 Protecting Biodiversity and Supporting Local Economic Development (LED)

Biodiversity-compatible LED includes a range of activities which should be focused in CBA and ESA, such as invasive alien clearing, wetland rehabilitation, community-based tourism projects, craft markets based on sustainable harvesting, wildflower harvesting, bee farming, natural product sector (medicinal herbs, aromatherapy oils, etc.) and the protection of ecotourism assets and protected areas. The WCBSP also provides a mechanism for streamlining land use decision-making outside of CBA and ESA, whilst ensuring that economic growth does not compromise our natural capital. There are programmes that assist with protecting biodiversity while creating jobs, and that are implemented by various government agencies (Box 4.1).

Box 4.1 **Examples of social-ecological projects implemented by government agencies**

Examples of social-ecological projects implemented by government agencies:

- People and Conservation (SANParks and CapeNature)
- LandCare (WC DoA)
- Working for Water (DWS, SANParks and CapeNature)
- Working for Fire (DWS)
- Working for Wetlands (DWS and SANBI)
- Working for the Coast (DEA)
- CoastCare (DEA)


Kevin Shaw

Most of these programmes fall within the Expanded Public Works Programme led by the Department of Public Works (visit www.epwp.gov.za). Municipalities, with the assistance of other agencies, could encourage the development of small scale community projects that provide benefits for poor rural and urban communities and the environment.

Projects related to the safeguarding or restoring of biodiversity should be located in CBA and ESA. In this way, the BSP Map enables the identification of IDP projects and supports LED and poverty alleviation, while promoting sustainable economic growth.

4.4 Using the Biodiversity Spatial Plan in developing Spatial Development Frameworks

The Western Cape Province and municipalities are obliged under SPLUMA and LUPA to develop maps and associated reports, termed Spatial Development Frameworks (SDFs), which indicate desired patterns of land use and provide strategic guidance for the location and nature of development and conservation. The PSDF conveys the Western Cape's spatial agenda to municipalities; so that their IDPs, SDFs and land use management systems are consistent with, and take forward the provincial spatial agenda. The PSDF takes the Western Cape on a path towards (i) more inclusivity, productivity, competitiveness and opportunities in urban and rural space-economies; (ii) better protection of spatial assets (e.g. cultural and scenic landscapes) and strengthened resilience of natural and built environments, and (iii) improved effectiveness in the governance of urban and rural areas. On a municipal level, a SDF includes the spatial depiction of an IDP but is not restricted to that spatial depiction. It is important to note that the time horizon for SDF strategic consideration is a minimum of 10 years and often significantly longer when factors such as climate change and population growth are taken into account. The SDF is a legally binding spatial framework that promotes sustainable environmental, economic and social development in a municipality. Such a plan and framework must ensure sustainability [Section 26 of the Municipal Systems Act (Act No. 32 of 2000)].

Refer to Table 4.3 which shows the alignment of the IDP and SDF processes with this WCBSP.

TABLE 4.3: A guide to incorporating the Biodiversity Spatial Plan into Integrated Development Planning and Spatial Development Frameworks; as adapted from the STEP Handbook (Pierce & Mader 2006)

IDP Phases	Basic Elements in Developing the SDF	Use of Biodiversity Spatial Plan
Phase 1: Analysis		
Gather all information. Analyse information for - i. trends; and ii. issues that can be shown on a map. Identify needs, including normalisation after apartheid, transport, etc. Draft report for public comment.	Biodiversity importance of land (or category on the BSP Map), current land use, agriculture, the built environment, infrastructure, transport routes, watersheds, geology etc., heritage sites, State of Environment Reporting, Strategic Environmental Assessment. i. Trends (e.g. the direction in which the town is growing, land suitable for development); ii. issues (e.g. a need for housing, schools or a clinic in a certain area; protecting ecosystem services).	Planners and decision-makers use the BSP Map to identify which areas to develop and which to leave undeveloped and which to prioritise for conservation.
Phase 2: Strategy		
Identify vision, mission, objectives, strategies for dealing with needs, problems and issues, such as Local Economic Development, poverty alleviation, the natural environment, possible projects. Draft reports for public comment.	BSP Map indicates: Priority areas for conservation, opportunities and constraints on developments. Draft report(s) for public comment.	Plan which areas to develop and which to leave undeveloped and conserved.
Phase 3: Projects		
Identify priorities, refine projects. Prioritise projects and finances, which together influence the SDF. Assess environmental impacts of projects.	BSP Map indicates areas where restoration projects or other biodiversity related projects for poverty alleviation can take place e.g. SANParks People and Conservation, Working for Water, etc.	Identify areas for restoration projects, or other biodiversity related projects.
Phase 4: Integration		
5-yr financial plan and programmes for capital investment, integrated Local Economic Development, environment (including biodiversity), poverty alleviation, gender equity, etc. Draft IDP report for public comment.	Draft SDF report and map based on the BSP Map with overlying infrastructure and land uses, sites for integrated projects (e.g. large scale housing development, poverty alleviation projects e.g. restoration), open spaces, urban edge, development nodes, corridors, cemeteries, waste sites, social and emergency services. Draft SDF report and map for public comment.	Provincial officials, non-governmental organisations and public to ensure that the WCBSP is taken into consideration and upheld.
Phase 5: Approval		
Final IDP report approved based on the BSP Map and other WCBSP information.	Final SDF report and map approved based on the BSP Map and other WCBSP information.	Councillors, municipal officials, provincial officials, non-governmental organisations and public to ensure that the WCBSP is upheld.

According to the Western Cape Provincial Spatial Development Framework, local SDFs should divide the entire landscape into spatial planning categories (SPCs) "to reflect a vision of how the area should develop spatially, so as to ensure sustainability". The SDF also provides policies, management objectives and guidance for appropriate land use within each SPC. Table 4.4 shows the BSP Map categories and the recommended corresponding Spatial Planning Category.

TABLE 4.4: Categories on the Biodiversity Spatial Plan Map and their recommended corresponding Spatial Planning Category

BSP Category / SPC	Protected Areas	CBA 1	CBA 2	ESA 1	ESA 2	ONA	NNR
Core 1							
Core 2							
Buffer 1							
Buffer 2							
Intensive Agriculture							
Settlement							
Industry & Existing Mining							

From a biodiversity perspective, SPCs indicate areas where limitations on land use need to be applied in order to protect biodiversity. The two SPCs most relevant to biodiversity conservation and the BSP Map are those referred to as "Core" and "Buffer".

The "Core" includes areas that are currently protected as well as areas that need protection because they are important areas for biodiversity, i.e. CBA. Within the province, we can achieve consistency in mainstreaming biodiversity priority areas into municipal spatial products, by aligning the BSP Map categories with the SPCs as recommended in Table 4.4.

The WCBSP and guidelines provide crucial information which will assist in the development of an SDF, namely:

- **Strategic Environmental Assessment:** In terms of the Local Government: Municipal Planning and Performance Management Regulations 21 (published in terms of section 120 of the Municipal Systems Act), SDFs should include a Strategic Environmental Assessment which must be aligned with those of neighbouring municipalities. A municipal Strategic Environmental Assessment identifies areas where particular development types can occur and "red-flags" or cautions against development in sensitive areas. The BSP Map provides detailed spatial information and policy guidelines for incorporation into a Strategic Environmental Assessment map.
- **Urban Edge Demarcating:** The SDF must delineate urban edges around existing urban nodes to protect the rural environment from urban sprawl and to encourage efficient settlement patterns. The BSP Map should be used when delineating the urban edge.
- **Zoning Schemes** identify areas where development should not take place, "to protect the special natural and environmental characteristics of an area … and to promote sustainable development". Furthermore, their "implementation has to be consistent with, and give effect to, the SDF" (adapted from the Western Cape Proposed Standard Draft Zoning Scheme By-law). When zoning schemes are revised or where rezoning or subdivision applications are being processed, the BSP Map should be consulted in order to avoid development in environmentally sensitive areas. More detailed guidelines are provided in Section 4.6.

- **Environmental Management Frameworks (EMFs)** designate areas on a map where development can or cannot occur without an authorisation, thereby streamlining the process of authorising development. EMFs also provide management priorities. The BSP Map can inform both these aspects.
- **Urban Open Space Systems** provide ecosystem services at local level e.g. clean air, fresh water, wastewater purification, flood protection and recreational space. The BSP Map assists in identifying certain areas that provide ecosystem services within urban settlements.
- **Policy guidelines:** The land and resource use guidelines (Section 4.2) provide key policy recommendations for input into an SDF Land use Management System.

The BSP Map and guidelines can be used to guide the location and nature of development and conservation, while ensuring alignment with adjacent municipal SDFs. These products also promote the establishment of 'Sustainable Human Settlements' by encouraging nodal development and protecting ecosystem services.

4.4.1 The UNESCO MAB Programme and the Western Cape Biodiversity Spatial Plan

South Africa has signed a country agreement with UNESCO in 1995, resulting in the introduction of the Man and the Biosphere (MAB) Programme to the country. Implementation of the MAB Programme finds spatial existence in the designation of special sites as biosphere reserves. At present there are nine biosphere reserves in South Africa, of which five are located in the Western Cape (Figure 4.1), namely:

- Kogelberg Biosphere Reserve, 103 629 ha;
- Cape Winelands Biosphere Reserve, 322 032 ha;
- Cape West Coast Biosphere Reserve, 387 000 ha;
- Gouritz Cluster Biosphere Reserve, 3 187 893 ha;
- Garden Route Biosphere Reserve, 700 500 ha.

The total area covered by biosphere reserves in the Western Cape amounts to 4 701 054 ha which covers 36% of the province. Biosphere reserves offer a social-ecological landscape management tool towards promoting sustainable development. Biosphere reserves are collaboratively managed by all major stakeholders, usually through the vehicle of a non-profit company.


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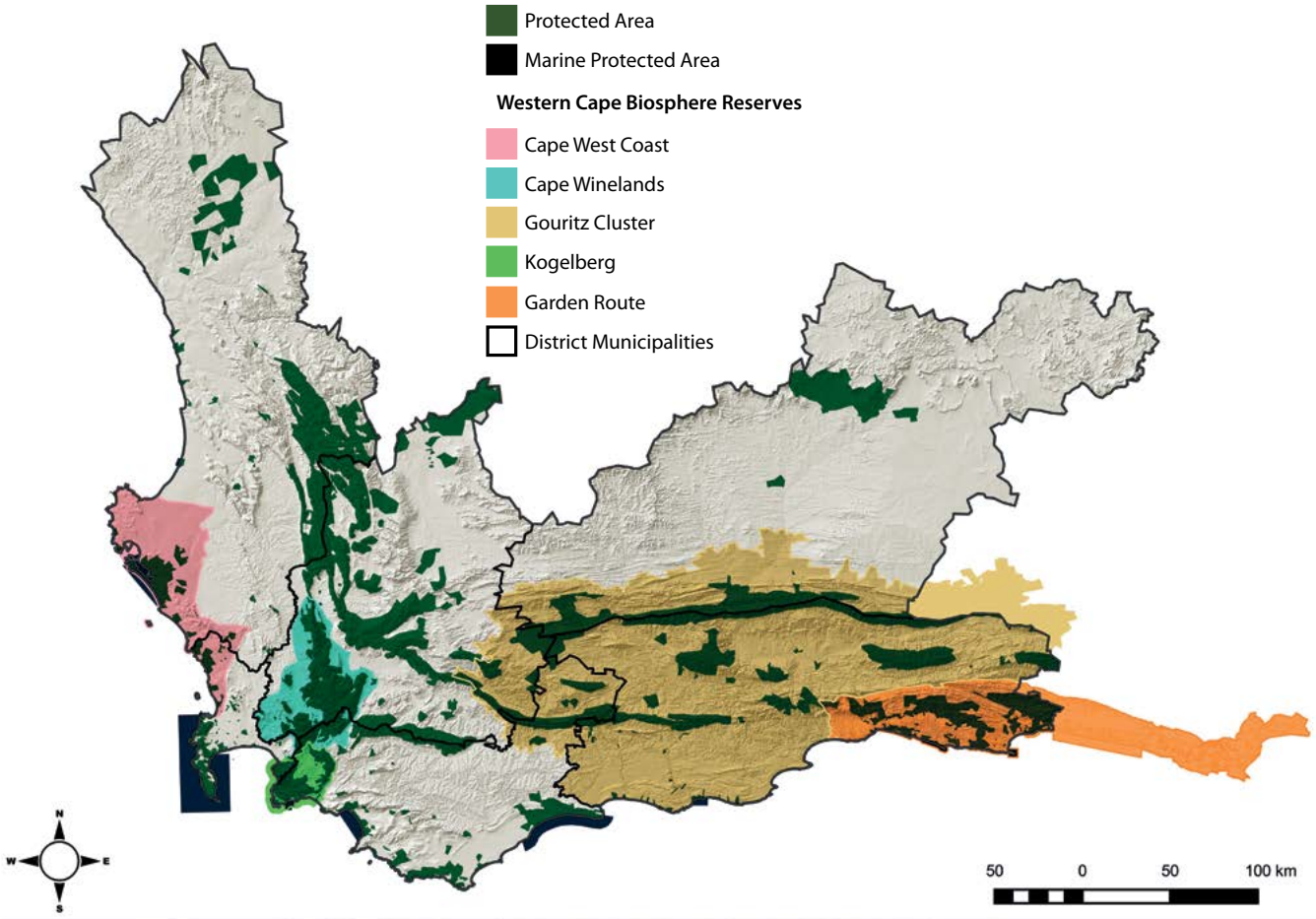

FIGURE 4.1: Biosphere Reserves in the Western Cape Province

The Western Cape Biosphere Reserves Act (Act 6 of 2011 – to be repealed and replaced by inclusion within the Western Cape Biodiversity Bill), regulates the drafting of spatial development frameworks (also referred to as framework plans) for all biosphere reserves. These SDFs provide for integrated development and management of all land uses within the biosphere reserve's area of influence, which stretches across municipal boundaries. The SDFs need to incorporate the UNESCO prescribed three-tiered zonation system of a biosphere reserve, namely core areas (natural areas with statutory conservation status), buffer areas (near-natural areas that provide a buffering mechanism to the core) and transition areas (incorporating other land uses and promoting sustainable development principles). Biosphere reserve zonation could assist municipalities in developing land use plans, but must be aligned with, and incorporated as part of the municipal IDP and SDF. Table 4.5 indicates the relation between biosphere reserve zonation and the BSP Map categories.

TABLE 4.5: Biosphere Reserve zones in relation to the Biodiversity Spatial Plan Map categories

BIOSPHERE RESERVE ZONES	Protected Areas	CBA 1 (terrestrial, forest, aquatic)	CBA 2 (degraded)	ESA 1	ESA 2	ONA (natural, near-natural)	ONA (degraded)	NNR
Core								
Buffer								
Transition								

4.5 Land use Guidelines within Land Use Zones Used in Spatial Planning

The land use planning framework legislation in the form of SPLUMA and LUPA require of municipalities to have single zoning schemes for their entire area of jurisdiction. The content of the zoning scheme in respect of zonings and land uses is purely a municipal competency; as a result the zoning schemes for the different municipal areas may differ to various degrees in respect of zonings and permissible land uses. LUPA provides for minimum norms and standards for effective municipal development management and therefore the Western Cape Government drafted a provincial standard zoning scheme[17] to guide municipalities in the drafting of their own municipal by-law on the zoning scheme. A zoning scheme consists of zoning scheme regulations, a map and a register. This scheme describes zones in which various land uses are either allowed or prohibited on certain portions of land, regulated through a permitting system. To simplify the integration of the biodiversity classes, land uses were clustered into seven categories which should cover all potential zoning schemes adopted by each municipality. As far as possible, the BSP Map categories have been integrated with the existing zoning definitions used in other planning schemes as indicated in Table 4.6 and Table 4.7. This should make it easier for biodiversity priorities to be adequately represented in existing spatial planning systems.


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17 Proposed Standard Draft Zoning Scheme By-law for the Western Cape, 2017.

TABLE 4.6: Critical Biodiversity Area Categories and Land Use Zones

LAND USE CATEGORIES LAND USE SUB-CATEGORIES (Refer to table 4.7 for descriptions)	
MAP CATEGORY	**DESIRED MANAGEMENT OBJECTIVE**
Protected Area	Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.
Critical Biodiversity Area 1	Keep natural, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land-uses are appropriate.
Critical Biodiversity Area 2	Keep natural, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land-uses are appropriate.
Ecological Support Area 1: Terrestrial	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
Ecological Support Area 1: Aquatic	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
Ecological Support Area 2	Restore and/or manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services.
ONA: Natural to Near-Natural	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land-uses, but some authorisation may still be required for high impact land uses.
ONA: Degraded	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land-uses, but some authorisation may still be required for high impact land uses.
No Natural Remaining	These areas are suitable for development but may still provide limited biodiversity and ecological infrastructure functions and should be managed in a way that minimises impacts on biodiversity and ecological infrastructure.

Conservation		Agriculture		Tourism and Recreational Facilities		Rural Accomodation		Urban			Business & Industrial				Infrastructure Installations			
Proclaimed Protected Areas	Other Nature Areas	Intensive Agriculture	Extensive Agriculture	Low Impact Facilities	High Impact Facilities	Agri-worker Accommodation	Small holdings	Urban Development & Expansion	Community Facilities & Institutions	New Settlements	Rural Business	Non-place-bound Industry (low-moderate impact)	Non-place-bound Industry (high impact)	Extractive Industry (incl. Prospecting)	Linear – roads & rail	Linear – pipelines & canals	Linear – powerlines	Other Utilities
Y = Yes: Permissible land uses that are not likely to compromise the biodiversity objective						R = Restricted: Land-uses that may compromise the biodiversity objective are only permissible under certain conditions (refer to Table 4.7 for conditions)					N = No: Land-uses that will compromise the biodiversity objective and are not permissible							
Land use within proclaimed protected areas are subject to management plan drawn up for that specific protected area.																		
Y	Y	N	R	N	N	N	N	N	N	N	N	N	N	N	N	N	R	N
Y	Y	N	R	R	N	N	N	N	N	N	N	N	N	N	R	R	R	N
Y	Y	N	R	R	N	N	N	N	N	N	R	R	N	N	R	R	R	R
Y	Y	N	R	R	N	N	N	N	N	N	N	N	N	N	R	R	R	N
Y	Y	N	R	R	N	N	R	N	N	N	N	N	N	N	R	R	R	R
Y	Y	R	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	Y	Y	R	R	Y	R	R	R	R	R	R	R	Y	Y	Y	Y
R	R	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

TABLE 4.7: Land Use Activity Descriptions and Biodiversity-related Conditions/Controls

1. Conservation	This is a land use activity where conservation is the major objective. CBAs are suitable sites to be zoned as the relevant Conservation/Open Space category. Subject to stringent controls the following biodiversity-compatible land use activities (i.e. those of very low impact) may be accommodated in CBAs: 1. a) **Conservation management activities** such as the clearing of invasive alien species, research and environmental education. 1. b) **Low intensity ecotourism activities** such as recreation and tourism (e.g. hiking trails, bird and game watching, and small-scale, eco-friendly visitor overnight accommodation) with limited access points. 1. c) **Sustainable consumptive activities:** Harvesting of natural resources (e.g. wild flowers for medicinal, culinary or commercial use). **Assumes the following conditions/controls:** • These land uses are limited to very low transformation levels for infrastructure development. Unless existing infrastructure already exists, this should be used. Alternatively transformed areas should be utilised. • Environmental Management Plans are required to ensure appropriate protection of the receiving environment e.g. sustainable harvesting volumes, periods, etc. • Green technology and architectural design principles have been adopted. • The entire property or a part thereof (depending on the land use activity above) is under some form of conservation agreement or mechanism. These mechanisms would include formal protected areas in terms of NEM:PAA, appropriate zoning (in terms of the Land Use Planning Ordinance) and other Conservation Areas, such as stewardship agreements or conservancies.
2. Agriculture	This category includes all forms of agriculture as described below. **2. a) Intensive agriculture, including:** • All areas of High Potential and Unique Agricultural Land, together with areas of lower agricultural potential where particular agricultural practices may themselves contribute to the character of the environment, the agricultural working landscape or the local economy. • **Forestry or Timber Plantations (timber production)** **Includes**: all timber plantations, mainly Pinus, Eucalyptus and Acacia plant species; **Assumes the following conditions/controls:** monoculture of alien timber species with heavy impact on hydrology and soil erosion and introduction and spread of a variety of the most aggressive alien invasive plants. • **Irrigated Crop Cultivation** **Includes:** all irrigated crops (vegetables) and irrigated tree crops (orchards and vineyards); **Assumes the following conditions/controls:** intensive production activity with high nutrient and agro-chemical inputs and often two crops per year (but even just ploughing, with no chemicals etc., results in irreversible loss of natural habitat). • **Dryland Crop Cultivation** **Includes:** all tillage cultivation of non-irrigated crops, mostly single-season annuals, but including perennial and orchard-type tree crops if cultivated with an indigenous grass layer; **Assumes the following conditions/controls:** crop production methods that conserve water and protect against soil erosion, limited and responsible use of fertilisers, pesticides and other agrochemicals and genetically modified organisms. • **Space extensive agricultural enterprises (e.g. intensive feed-lots, poultry battery houses)** **Includes:** all intensive animal production systems, that are dependent primarily on imported foodstuffs and confinement; includes dairy farming and all areas in production support for dairy, including pastures, fodder and grain crops, much of which is usually irrigated; **Assumes the following conditions/controls:** To be located in close proximity to regional routes (including rail) to facilitate product and requisite movement and supply.

2. Agriculture	**2. b) Extensive agriculture, including extensive livestock or game farming** **Includes:** livestock or game production and related tourism activities on extensive land portions of natural land cover. Could include private game reserves, sustainable commercial hunting along with other consumptive and non-consumptive use of natural resources. Private game reserves to be officially protected through various mechanisms (e.g. NEMPAA or other conservation agreements), with strict limits on the level of development considered acceptable for lodge and other accommodation infrastructure. **Assumes the following conditions/controls:** application of minimum size criteria for economic sustainability as are applied to rangeland livestock farming; strictly limited development for revenue generating purposes such as intensified tourism or sectional ownership. Stringent management conditions apply, such as – • Faunal specialist to undertake carrying capacity study for game reserves/production. • Ensure riparian and wetland buffer areas are protected. • Strict adherence to stocking rates for extensive agriculture. • For game reserves, indigenous species only to be stocked. • Environmental Management Plan, including fire management measures, if necessary. • These land uses are limited to very low transformation levels for infrastructure development. • Location of infrastructure, either within disturbed/transformed areas or in existing buildings, where possible.
3. Tourism and Recreational Facilities	Includes a broad range of rural tourist and recreational facilities in support of sustainable rural tourism, rural businesses and communities, as well as to provide for the rural recreational and leisure needs of urban dwellers, namely: **3. a) Low Impact Facilities** **Includes**: Small-scale tourist facilities (e.g. Lecture rooms, restrooms, restaurants, gift shops), farm rental units, camp sites, outdoor recreation (e.g. hiking and mountain biking trails) and non-place bound tourist and recreational facilities, e.g. zip-lines. **Assumes the following conditions/controls:** • Non-place-bound tourist and recreational activities and facilities located in or peripheral to existing rural settlements. • Rural tourist and recreational activities and facilities to be linked to a natural setting or feature. • Location of infrastructure either within disturbed/transformed areas and existing buildings, where possible. **3. b) High Impact Facilities:** **Includes**: Golf courses, golf estates, polo fields, polo estates, hotels and resorts and other establishments allowing sleepover of more than 15 people. **Assumes the following conditions/controls:** • All forms of holiday accommodation are encouraged within existing structures or on existing disturbed or transformed areas and within close proximity to existing infrastructure (e.g. roads and electricity). Although encouraged for resort developments too, this is not always possible given the unique nature of the setting required, which will most likely be place-bound. Most holiday accommodation should be provided in or adjacent to existing towns and rural settlements, although it can be accommodated in the rural landscape. However, the form and scale of facilities should be aligned with the character, quality and environmental sensitivity of the rural landscape. Certain norms (e.g. number of guesthouses or B&B per farm) must be applied, as per the Rural Land use Planning and Management Guidelines. • Restricting large-scale recreational developments including a residential component to a location in the "urban fringe", allowing for their longer term inclusion inside the urban edge. • Development outside of ecologically sensitive areas e.g. river-beds and their riparian zones, wetlands and their natural buffers, flood-lines. • High impact facilities outside of priority ecological or landscape corridors i.e. CBA and ESA.

4. Rural Accommodation	**4. a) Agri-worker accommodation** **Includes:** This land use includes residences for farm workers and retirees "on-farm" i.e. where housing is available to farm workers who currently live on the farm and will be living there in future, either due to personal preference (e.g. their tenure rights, rural surroundings, place for retirement etc.), or because circumstances require it (e.g. working hours etc.). Does not refer to the use of farmworker accommodation for the use of tourism or second homes. **Assumes the following conditions/controls:** • Fragmentation of agricultural landscape and land for agricultural purposes is not being threatened by the "urbanization" of rural areas. • Where possible, clustering of units in distinct housing precincts located in visually unobtrusive locations and existing footprints, but enjoying convenient access to the rural access network. **4. b) Smallholdings** **Includes:** Smaller agricultural properties which may be used for agriculture, but may also be occupied as places of residence by people who seek a rural lifestyle, and usually includes agriculture, dwelling house, home occupation. **Assumes the following conditions/controls:** • New smallholding developments for rural lifestyles to be restricted to inside the medium to long term urban edge. • Bona-fide small-scale agricultural properties (e.g. agricultural allotments) should be located outside the urban edge within areas of intensive agriculture (existing or potential). • A 'lifestyle' smallholding unit size of between 4 000 m^2 and 5 ha is recommended inside the urban edge, with consideration to subsequent subdivision as part of the urban growth frontier. The rural landscape character of the area should be considered in determining the appropriate unit size. A minimum agricultural holding size of 8 000 m^2 is recommended for small-scale agricultural properties within Agriculture SPC. • Compilation of a Management Plan for new and existing smallholding areas.
5. Urban	**5. a) Existing settlements and urban expansion** **Includes:** Metropolitan areas, cities, larger towns, small towns, villages and hamlets. **Assumes the following conditions/controls:** • The control of urban expansion through the delineation of an urban edge to prevent urban sprawl. • The delineation process is guided by the provincial urban edge guideline document and informed by the Western Cape Biodiversity Spatial Plan, for example: a Critical Biodiversity Area Map is used to delineate a boundary of the urban edge. • The promotion of compact urban settlements, whilst maintaining an open space system (where possible) that is informed by a fine-scale biodiversity plan or map. **5. b) Community Facilities and Institutions** **Includes:** Hospitals, clinics, schools, churches, police stations, fire stations, community halls or other gathering places. **Assumes the following conditions:** • Facilities located within existing towns and rural settlements; in close proximity to a settlement or located on a regional route, outside of environmentally sensitive areas e.g. flood-lines, river and wetland buffers and Special Habitats. • In the absence of public land, establish facilities "on-farm", utilizing existing farm structures or existing footprints. • Location of facilities to target disturbed areas and areas of low agricultural potential in order to avoid fragmentation of super-blocks. **5. c) New settlements** that will service isolated farming areas, rural mines and rural significant infrastructural developments (e.g. power plants) or proclaiming the urban component of existing settlements (e.g. church and forestry). **Assumes the following conditions/controls:** New settlements located in the rural area when necessitated by unique circumstances (e.g. servicing of isolated large infrastructural projects outside the servicing sphere of existing settlements) or in order to proclaim the urban component of existing rural church, forestry or conservation settlements (i.e. transformation of certain rural areas).

6. Business and Industrial	**6. a) Rural business** **Includes:** Farm stalls and farm shops, restaurants/taverns and venue facilities (e.g. conference/ wedding); agricultural co-operative, filling station/petro-port, tourist retail outlet, plant nursery, hotel/ motel, tourism office, commercial kennel. **Assumes the following conditions/controls:** • Farm stall restricted to selling products produced and processed on the farm to the general public, located either in the farmstead precinct or abutting a tourist route, if present. • Restaurant, tavern and venue facility located within the farmstead precinct. • Non-place-bound business located in and peripheral to rural settlements, outside of environmentally sensitive areas i.e. CBA and ESA. • Location of infrastructure either within disturbed/transformed areas and existing buildings, where possible. **6. b) Non-place-bound industry** **Includes:** Examples include (but are not limited to) manufacturing of agricultural requisites (such as pallet making, bottle labelling), processing of regionally sourced products (such as fruit cannery, abattoir and meat processing plant), transport contractors, dairy depots, builders yards and processing rural sources material (e.g. pottery manufacturing from kaolin). Examples of high impact industries include fish processing, paper manufacturing, mineral processing, oil refineries and power plants. **Assumes the following conditions**: • All non-place-bound industry (i.e. rural industry and service trades) to be located in and peripheral to existing settlements outside of environmentally sensitive areas e.g. CBAs and ESAs. • Appropriate buffers are allowed for between industrial developments and environmentally sensitive areas (especially for high impact industries). **6. c) Extractive Industry which is place-bound** **Includes:** Quarrying and mining and secondary beneficiation. Also takes into consideration visual, physical and chemical aspects of these activities, mine waste and refuse dumps, urban waste sites and landfill sites. **Assumes the following conditions:** Extractive industry to be located at the mineral source within the rural area, and informed by environmental considerations (should be located outside of environmentally sensitive areas) and post-mining rehabilitation.
7. Infrastructure Installations	This category includes transport and service infrastructure servicing both urban and rural areas. **7. a) Linear infrastructure** **Includes:** Roads, railways, pipelines, canals, bulk water transfer schemes. **7. b) Other utilities** **Includes:** Waste water treatment works, water purification plants, reservoirs, dams, communication base stations, power stations, renewable energy facilities. **Assumes the following conditions for both categories:** • Installations to be located on transformed, disturbed or low-value agricultural land, where possible. • Infrastructure installations requiring a location outside the urban edge is restricted to extensive agricultural areas peripheral to settlements in close proximity to regional routes to facilitate access and restrict fragmentation of the agricultural landscape. • Installations in intensive agricultural areas are restricted to essential services (e.g. irrigation infrastructure, safety and security). • Energy generating developments (i.e. nuclear power, wind farms, etc.) are associated with large areas of land left undeveloped thereby maintaining low transformation levels relative to the property size. • Avoidance of sensitive areas such as flood lines, river and wetland buffers and special habitats. • All water-use developments should be subject to the Ecological Reserve in terms of the National Water Act.

4.6 Using the Biodiversity Spatial Plan proactively in Environmental Assessments

Environmental assessments are used to determine the broad 'environmental fit', and ecological sustainability of proposed land use changes. It also establishes the biodiversity context within which a change in land use is being contemplated, and against which likely impacts (both site-based and cumulative) must be assessed. The BSP Map and associated land use guidelines provide a proactive and scientific basis for assessing the potential impacts of proposed land uses, and play an important role in providing a biodiversity-sensitive perspective in this process.

Up-front reference to systematic biodiversity plans also indicates whether habitat modification in a particular place will contribute to cumulative impacts by reducing the chances of meeting biodiversity targets for specific ecosystems or species, or by contributing to habitat fragmentation and degradation of ecological processes.

Proactive emphasis on pre-application screening to prevent an irreversible net loss of biodiversity is a defining principle of international best practice in environmental assessment (IAIA 2005). It also demonstrates practical compliance with the mitigation hierarchy (see Figure 4.2), which requires that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be avoided, are minimised, remedied or offset (Section 2(4)(a)(i), National Environmental Management Act, Act 107 of 1998).

Pre-application biodiversity screening can:

- Show the decision-making authority that potential conflict between biodiversity priorities and other land uses has been identified and resolved by well-informed project planning.
- Allow the proponent to take an informed decision about the biodiversity (and administrative and, by implication, financial) risks of proceeding with a particular project.
- Identify the scope, type and intensity of environmental assessment that is likely to be required if an application were to proceed.
- Ensure that a project is consistent with the 'Duty of Care' principle (i.e. that the project proponent has taken reasonable measures to prevent significant degradation of the environment).
- Emphasise the fundamental role of alternatives in selecting the best practicable environmental option.
- Ensure that environmental management protects sensitive, vulnerable, highly dynamic or stressed ecosystems.
- Allow the proponent to design a development proposal taking into consideration the environmental constraints.

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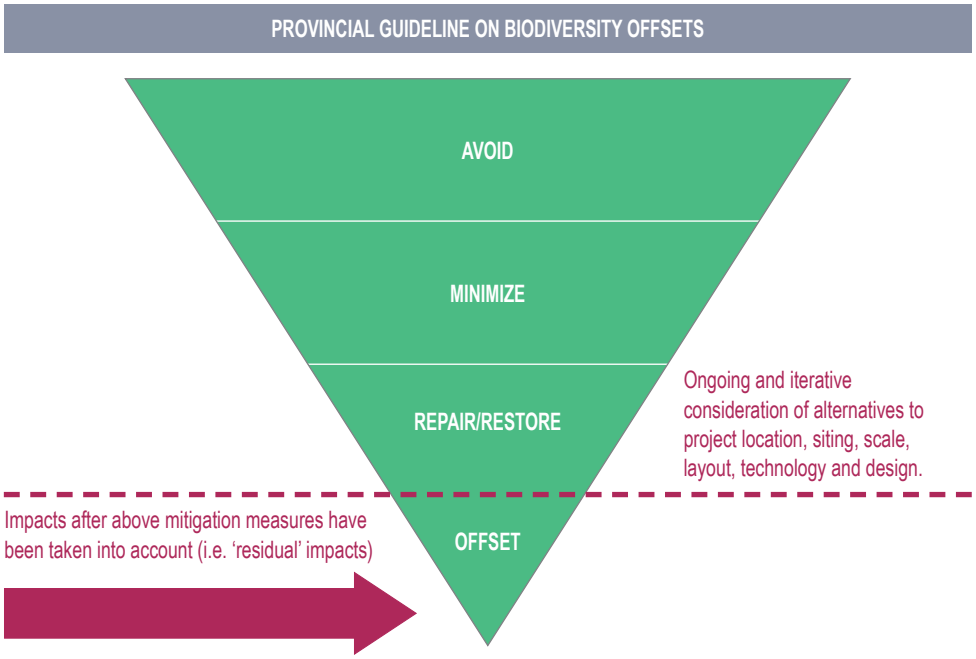

FIGURE 4.2: The Mitigation Hierarchy (adapted from DEA&DP 2007 and 2011)

In most situations, a full investigation into the biodiversity importance of a site is only triggered when a 'listed activity' in terms of NEMA is proposed, and circumstances therefore warrant specialist investigation. The BSP Map can serve as an early warning signal that a biodiversity assessment needs to be undertaken prior to any decision about a proposed change in land use.

NOTE: The approach advocated here is not a substitute for specialist knowledge and review in an EIA. Early appointment of a knowledgeable biodiversity specialist is strongly advised or required, especially where projects may affect either terrestrial or freshwater CBAs, ESAs or other features important for biodiversity conservation.

There are several examples of *pro forma* terms of reference or guidelines for dealing with biodiversity in environmental assessment and planning:

- *Guideline for involving biodiversity specialists in EIA processes* (Brownlie 2005).
- *Ecosystem Guidelines for Environmental Assessment in the Western Cape* (Cadman 2016).
- The *Guidance Document on Biodiversity, Impact Assessment and Decision Making in Southern Africa* (Brownlie *et al.* 2006) offers a useful overview of key concepts relating to environmental assessment and biodiversity, EIA review, and biodiversity-related issues in sectors such as mining, agriculture and water resources development.
- The latest *National Biodiversity Assessment* (Driver *et al.* 2012) provides information about ecosystem threat status. More up-to-date ecosystem threat status information is, however, periodically available from CapeNature and posted on SANBI's Biodiversity GIS website.
- *Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector* (DEA *et al.* 2013).
- The *Department of Water and Sanitation's Guideline: assessment of activities/developments affecting wetlands.*

4.7 Using the Biodiversity Spatial Plan in Reactive Land Use Impact Assessment and Decision-making

All decisions regarding land use applications in the Western Cape are going to be evaluated by the authorities using the BSP Map and therefore it makes sense to consider these prior to and during the EIA process.

These are five basic steps that should be followed when using the BSP Map to determine the biodiversity context of a proposed land use and to identify potential 'red flags' that may need closer investigation, or that should inform the revision of project plans and alternatives.

STEP 1: Prepare for the site visit

The BSP Map, the associated land use guidelines, and the underlying GIS layers (provided with the shape files on the accompanying disc) can be used to determine the biodiversity context of a proposed land use site, ahead of making the first site visit. Underlying biodiversity information may include *inter alia* vegetation type, Species of Special/Conservation Concern, aquatic feature type, presence of special habit, etc. To do this, it is necessary to answer four simple but fundamentally important questions, which are:

- How important is the site for meeting biodiversity objectives (e.g. is it in a CBA or ESA)?
- Is the proposed land use consistent with the desired management objective and the recommended Spatial Planning Category?
- Does the sensitivity of this area trigger CapeNature's requirements for assessing and mitigating environmental impacts of development applications?
- What Species of Conservation Concern could occur on the site?

The answers to these questions will give an indication of: (i) how important biodiversity will be as a factor in the decision-making process at this site; (ii) how much effort will need to be put into finding alternative sites to avoid significant impacts on biodiversity or ecosystem functioning, and (iii) the likelihood of it being necessary to appoint a biodiversity specialist during project planning and design for small scale projects, or to inform the Terms of Reference for specialists involved in larger projects.

STEP 2: Conduct the site visit

It is essential to ground-truth the BSP Map and conduct additional biodiversity assessments to determine the biodiversity importance of the site. Although the BSP Map is based on many data layers and the best available scientific information, these are only as accurate as the data that was available at the time, and errors of omission are more likely than errors of commission. The site visit is essential to ensure that mapped biodiversity features are consistent with those present at the site. Even sites that are considered to be of low importance (i.e. Other Natural Areas) based on the pre-visit assessment should not be dismissed as being unimportant without further investigation.

Planning to avoid, minimise and remedy impacts on biodiversity involves three key actions, after conducting a site visit with biodiversity specialists (if required) during the appropriate season/seasons:

a) Compare ground-truthed land cover with that depicted on the BSP Map

Apparent mismatches between mapped land cover and observed biodiversity features need to be recorded in a site assessment report and further planning should proceed according to the ground-truthed biodiversity attributes of the site. In cases where degraded or even cultivated land has been included in CBAs or ESAs, any changes in land use should be consistent with the desired management objective of the area.

The following are examples of situations in which degraded areas may have been identified as CBAs:

- Degraded land was deliberately assigned CBA or ESA status because it contributes to pattern targets or fulfils an essential ecological function, such as forming part of an ecological corridor or 'stepping stone' habitat (for example, old fields may have been selected for their connectivity value; this may seem counter-intuitive, but emphasises why the BSP Map needs to be carefully interrogated).
- The land cover has changed since the area was mapped (e.g. as a result of land use change or infestation by invasive alien plants).
- There was simply an error in the land cover classification.
- It is important to note that mismatches in land cover on the ground and in the BSP Map do not mean that an area is or is not a CBA or ESA. This can only be determined by running the systematic conservation planning process. However it is very important for these discrepancies to be recorded to allow improved plans in future.

b) Compare mapped CBA or ESA features with ground-truthed ones

It is also important to verify the BSP Map by comparing it with observed biodiversity and/or environmental conditions. In particular, the location and ecosystem status of CBA wetlands and the functionality of landscape-level corridors, may require field verification, but at a landscape scale. Any variance between biophysical features, and what is depicted on the map, needs to be recorded and reported to CapeNature's Land Use and Conservation Planning Unit.

More information on the interpretation of the BSP Map is provided in Section 5.1, entitled 'Frequently Asked Questions' at the end of this handbook.

c) Identify compromises and solutions that minimise impacts on biodiversity and conflicts in land use

Identify the best practicable environmental options for avoiding loss of biodiversity and disturbance to ecosystems, especially in CBAs, by applying the mitigation hierarchy and the land use guidelines recommended in Section 4.2. In particular:

- **Maximise connectivity in CBAs and ESAs, the retention of intact natural habitat and avoid fragmentation:** Design project layouts and select locations that minimise loss and fragmentation of remaining natural habitat, and maintain spatial components of ecological processes, especially in ecological corridors, buffers around rivers and wetlands, CBAs and ESAs. Activities that are proposed for CBAs must be consistent with the desired management objectives for these features and should not result in fragmentation.
- **Minimise unavoidable impacts:** Reduce the impact of the project footprint on biodiversity pattern and ecological processes.


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- **Take opportunities to conserve biodiversity:** Set aside part of the land at the proposed land use site, or another site of equivalent or greater biodiversity significance, to be managed for conservation purposes.
- **Remedy habitat degradation and fragmentation through rehabilitation**: Aim to reinstate pre-disturbance ecosystem composition, structure and functioning, especially in threatened ecosystems, CBAs and ESAs. Site-specific conservation measures may include contributing areas of natural habitat for the consolidation of corridor networks.
- **Promote long-term persistence of taxa of conservation concern:** Guidelines for promoting long-term persistence of taxa of conservation concern found at proposed development sites are provided in Appendix 1. The recommendations differ depending on the threat status of the taxa. Further detail is available in Driver *et al.* 2009.

STEP 3: Assess impact on biodiversity

If natural habitat will be affected by a proposed land use, relevant specialist surveys should be commissioned as part of the environmental impact assessment process, irrespective of the BSP Map category into which the site falls. In some cases it may be established that no significant impacts are likely, and in others significant impacts may be unavoidable. These scenarios call for different lines of action, as follows:

When no significant impacts are likely

In cases where the specialist confirms that a proposed land use development will have negligible or insignificant impacts on the biodiversity features of a site (CBAs, ESAs, threatened ecosystems, and species or habitats of special concern), this should be recorded in a brief report that:

- Demonstrates that reference was made to the relevant biodiversity plan, desired management objectives and land use guidelines.
- Describes the state of biodiversity at the preferred and alternative sites, covering aspects such as the mapped status of the habitat (e.g. is it a CBA or Threatened Ecosystem, etc.), biodiversity patterns and ecological processes, and any signs of degradation or infestation by invasive alien species.
- Describes how the proposed project would impact on the site at local and landscape scale.
- Includes a map or maps and interpreted photographs (preferably at a minimum of a 1:10 000 scale) that illustrate the biodiversity implications of the proposed land use.

The specialist's report should be appended to the relevant application form or environmental report and submitted to the relevant competent authority.

When significant impacts are unavoidable

When pre-application project planning has exhausted the preceding steps, and significant impacts on biodiversity cannot be avoided, minimised or remedied, the EIA practitioner should advise the proponent that:

In Critical Biodiversity Areas and Ecological Support Areas:

- Any irreversible loss of habitat would be highly undesirable;
- These biodiversity features must be treated as 'red flags' or even disqualifiers (Fatal Flaws);
- It is necessary to proceed with extreme caution, and with likely delays and higher costs;
- A SACNASP registered biodiversity specialist, with detailed terms of reference should be appointed early in the process so they have opportunity to assist with design or layout of the development and to conduct their surveys in the appropriate season;
- Use of any non-CBA or -ESA alternative sites would be highly desirable;
- Restoration and maintenance of ecological processes will be necessary.

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In Other Natural Areas:

- A specialist should survey the site for special habitats and species of conservation concern;
- Project design, implementation and management must emphasise, where relevant, the maintenance and restoration of ecosystem functioning (i.e. retention of ecological corridors and vegetation boundaries);
- Presence of species of special concern (e.g. threatened, endemic and rare species) and/or threatened or special habitats should result in a record of decision that avoids, mitigates or offsets loss of habitat. More information on biodiversity offsets is provided in Section 4.8.

STEP 4: Identify opportunities to conserve biodiversity

Always seek to take advantage of opportunities to conserve biodiversity and contribute to conservation gains when undertaking pre-application project planning, including:

- Setting aside part of the land on the site to be managed for conservation through one of the stewardship options;
- Setting aside another site of equivalent or greater biodiversity significance to be managed for conservation, through a stewardship agreement or biodiversity offset;
- Clearing alien vegetation; and
- Rehabilitating or restoring land or freshwater ecosystems that have already been degraded (note that rehabilitating or restoring land or ecosystems that will be disturbed as a result of the development does not constitute a conservation gain).

Site-specific conservation measures may also be translated into broader conservation benefits by contributing undeveloped property to the consolidation of land in support of corridor or landscape initiatives.

STEP 5: Include biodiversity considerations in the EIA report

Recommendations for project design and implementation should set out explicitly how the BSP Map – and, generally, biodiversity pattern (species of conservation concern) and ecological processes – have been taken into account. For example, through:

- **Determining the least damaging configurations/layouts** of the proposed development and its accompanying infrastructure;
- Reducing the overall number of units to **relieve pressure on natural habitat** and ecological processes;
- **Concentrating disturbance footprint in degraded or heavily modified areas** that have little viability for natural regeneration or restoration of indigenous vegetation; and
- Taking advantage of opportunities to **integrate *in situ* biodiversity conservation and management with the overall design** and operation of the proposed land use development.

4.8 Using the Biodiversity Spatial Plan in Biodiversity Offsets

Biodiversity offsets are conservation activities intended to compensate for the residual, unavoidable harm to biodiversity caused by development projects. It should preferably involve setting aside land for conservation in the same or similar habitat elsewhere, at the cost of the developer.

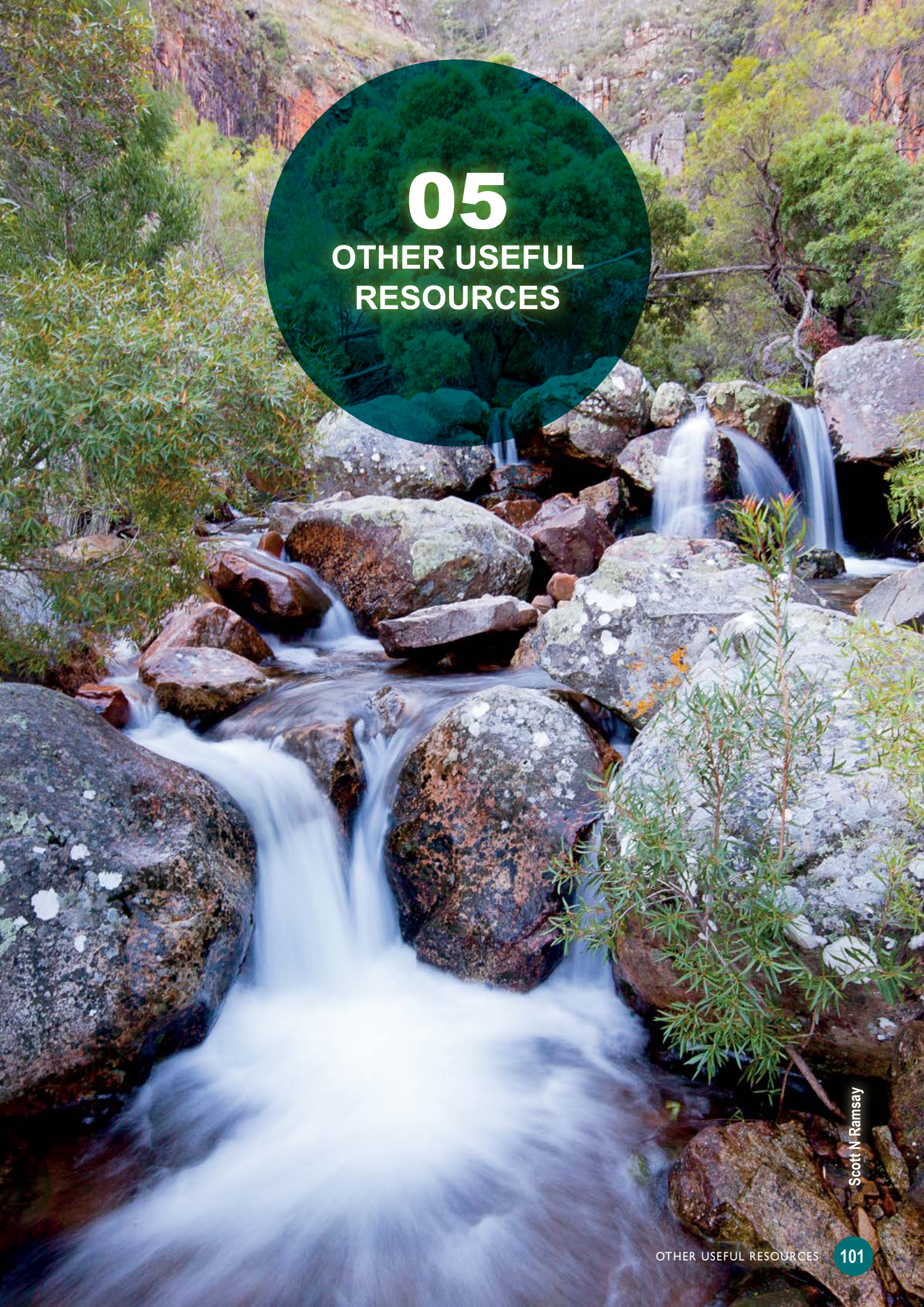
Biodiversity offset receiving areas are areas in the landscape that are selected and conserved in order to compensate for the unavoidable, residual negative impacts on biodiversity of the proposed development. They should be of greater or equal importance to the habitat and/or species which are being impacted on, or being lost.

Critical Biodiversity Areas are considered ideal biodiversity offset receiving areas. CapeNature and/or SANParks officials should be consulted when determining if a biodiversity offset will be required and if the proposed offset receiving area is suitable. Biodiversity offsets will most often need to be considered when a development impacts on a CBA, particularly if the habitat is Endangered. Ideally no further loss of Critically Endangered habitat should occur, but biodiversity offsets may be considered in exceptional circumstances.

For more detailed information on biodiversity offsets please refer to the draft Western Cape Provincial Guideline on Biodiversity Offsets (DEA&DP 2007[18]) and the National Biodiversity Offsets Policy[19].

18 Note that a revised version of the Provincial Guideline on Biodiversity Offsets is expected and should be used as soon as it becomes available.

19 https://www.environment.gov.za/sites/default/files/docs/discussiondocument_environmentaloffsets.pdf. An updated version (December 2016) is available on request from CapeNature.



05
OTHER USEFUL RESOURCES

Scott N Ramsay

5.1 Frequently Asked Questions

1. **What if the BSP Map indicates that the property is located within a CBA but the site visit reveals that the site is degraded or that no natural habitat occurs on the site?**

This can be explained as follows:

- The site, although degraded, is still contributing to the biodiversity of the area and has thus been correctly classified as a CBA. In such instances, the site should have been classified as degraded and the management guideline should be to rehabilitate if possible, and to discourage land use activities that have any future impact on biodiversity and ecological processes. This is most likely to be the case in Critically Endangered or Endangered vegetation units as even highly degraded but restorable habitat is required in order to meet conservation targets; or
- Disturbance to, or transformation of the site has occurred subsequent to the production of the land cover data that informed the BSP Map. If this is the case, it is possible that the site should not have been classified as a CBA. In such instances however, the site needs to be assessed for its potential to be rehabilitated and/or its role as part of a corridor. In the case of the latter, ecological processes must be maintained or restored. An investigation will need to be undertaken as to whether the activities which resulted in the disturbance took place with the necessary authorisations.

The bottom line is that a suitably qualified specialist is needed to interpret the site in relation to the BSP Map. Confirmation through a site visit, i.e. ground-truthing, is essential in all cases. Refer to the steps in Section 4.7 for guidance on this matter.

2. **What if natural habitat is found on a site but this is not indicated on the land cover map, and therefore the site is not classified as a CBA, ESA, or ONA?**

   Such inaccuracies may result from inconsistencies in scale or a classification error. If the BSP Map shows that no vegetation remains, but a site visit reveals the presence of natural habitat, refer to the vegetation GIS data to determine the vegetation type and then determine its ecosystem status. If the vegetation type is Critically Endangered, it would have been selected as a CBA and should have been classified as such. If the vegetation type is Endangered, the site is most likely a CBA. If the vegetation type is Vulnerable or Least Threatened, it may either be a CBA, an ESA, or an Other Natural Area. The site must then be assessed for the presence of features or ecological processes that would make it important for biodiversity conservation, or for the protection of ecological infrastructure. By identifying the biodiversity features in Table 3.3, it may be possible to determine the correct CBA status. Even degraded areas may still contain rare or Endangered species or be required to buffer more natural areas. The precautionary principle and all applicable objectives and recommended policies should still be applied during decision-making.

3. **What if the area has not been determined as a CBA but ground-truthing has revealed that plant species of conservation concern are present?**

   Whilst every effort has been made to include all the datasets of plant species of conservation concern in the analyses used to produce the Biodiversity Spatial Plan, it is always possible that new localities of individuals or even populations of plants will be found during the EIA process. This is one of the reasons ground-truthing remains of high importance. In this instance the conservation importance of the species found on site must be determined by considering its threat status, the size of the population on site as well as how many other known localities of the species there are in the immediate vicinity of the site, as well as in the broader region. It is always preferable to avoid species of

conservation concern, and search and rescue should only be considered as a last resort when all other mitigation measures have first been considered. Note that search and rescue of species of conservation concern is not considered as mitigation which is sufficient to reduce impact ratings.

It should further be noted that the focus is on conservation of habitat which supports the various species within that habitat, hence the use of the National Spatial Biodiversity Assessment vegetation types as the primary informant for the BSP Map. There are cases where threatened species, even Critically Endangered species with only a few small localities, persist within a highly degraded to transformed habitat fragment. In these cases an evaluation of the restoration potential of the habitat is required in order to determine the conservation value of the site. The site may have been mapped as No Natural Remaining despite containing threatened species.

4. **Do 'Other Natural Areas' still require a biodiversity assessment?**
In Other Natural Areas is it important to check for biodiversity features, e.g. wetlands or Species of Conservation Concern. Documented occurrences of special features or species is incomplete, therefore it is critical to verify that they do not occur on the site. Again the issue of scale is relevant here where there may be a small patch of habitat that should be avoided that is at a smaller scale than would be picked up on the land cover map.

5. **How does ecosystem status relate to the BSP Map?**
All intact patches of Critically Endangered ecosystems or features should be included as CBA. For Endangered, Vulnerable or Least Threatened vegetation types, the most efficient areas to meet national biodiversity thresholds have been classified as CBA, while the remaining areas are Ecological Support Areas or Other Natural Areas. This is done to ensure that an optimal layout of ecosystems are conserved and to prevent fragmentation of these ecosystems over time.

It is also important to keep in mind that two different ecosystem threat status references exist: those listed threatened ecosystems published in terms of Section 52 of NEMBA (Gazette No. 34809 of 09 December 2011), and also CapeNature's 2016 Ecosystem Threat Status information published as part of the Western Cape Biodiversity Spatial Plan, and considered best available science. Both are available on SANBI's BGIS website.

6. **Can the BSP Map assist in the selection of land for biodiversity offsets?**
Critical Biodiversity Areas are ideal biodiversity offset receiving areas and CapeNature and/or SANParks officials should be consulted for their inputs. If sustainable development is to be achieved, no CBA or part thereof should be impacted or disturbed in any way. If this is unavoidable, the loss of the CBA should be offset. The 'Provincial Guideline on Biodiversity Offsets' is available at https://www.westerncape.gov.za/text/2007/3/pgwcoffsetsguidelinedraft_5march_07.pdf (an updated version is available on request from CapeNature or the Department of Environmental Affairs and Development Planning).

It should be noted that in cases where a development which is considered to have over-riding socio-economic importance for the broader society has been approved within a CBA with the requirements for biodiversity offset, that the loss of CBA is likely to require an additional area of CBA within the next revision of the BSP Map in order to meet biodiversity targets.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7. **How do CBA and ESA affect existing land use rights?**
   The BSP Map does not grant or take away any existing land use rights. The BSP Map, including CBA and ESA, is intended to inform whether the proposed land use changes are desirable or not, but these will still require authorisation under various legislation before they can proceed.

8. **Will all CBA become Protected Areas?**
   It is not feasible for all CBA to be formally conserved in protected areas. Nonetheless, it is important that they are all afforded some protection through an appropriate mechanism. In addition to formal protected areas in terms of the NEM:PAA, other mechanisms include appropriate zoning (using municipal zoning schemes), and the establishment of other conservation areas such as biosphere reserves, stewardship agreements or conservancies. The BSP Map will be used to inform the location of future protected areas and priority landscape corridors. They are also afforded protection through NEMA in controlling land use change on CBAs.

9. **What does it mean if a CBA is lost?**
   The BSP Map identified the most land-efficient option to meeting all national and provincial biodiversity thresholds. Any disturbance or conversion of habitat within a CBA means either: (1) the irretrievable loss of an important ecological feature or part or whole of a corridor, or (2) more land will be required in order to meet the same threshold (refer to the question on biodiversity offsets).

10. **Will the BSP Map ever change?**
    Land use is dynamic and all maps need updating. The BSP Map will need updating owing to inconsistencies and changes in the land cover information; any loss of CBA and ESA; and improved biodiversity knowledge. Nonetheless, the current BSP Map will form the basis for future updates. Note that if the BSP Map is to be used as the basis for a bioregional plan, it would have to be updated every five years in terms of the NEM:BA.

5.2 Environmental Legislation and Policy relevant to the BSP Map

South African Constitution (Act 108 of 1996)

The Constitution is the supreme law of the Republic. It includes the respect for rights and uses of land owners and traditional communities, specifically chapter 1 (Founding Provisions), chapter 2 (Bill of Rights) and chapter 12 (Traditional Leaders). It also states specific objects of municipalities that include *inter alia* "to promote social and economic development" and also "to promote a safe and healthy environment".

National Environmental Management Act (Act 107 of 1998)

The NEMA is an overarching framework act covering broad principles of environmental management and can be regarded as the most important piece of environmental legislation. The NEMA provides for the use of tools such as environmental impact assessments and environmental management frameworks.

National Environmental Management: Biodiversity Act (Act 10 of 2004, as amended)

The Biodiversity Act provides for the co-ordinated management, conservation and sustainable use of biodiversity across the whole country. It promotes an ecosystem-orientated approach to the management of biodiversity, taking into account the need for social transformation and development goals to be met, and recognising that biodiversity conservation involves working beyond the boundaries of formal protected areas. The Biodiversity Act introduced a new set of biodiversity planning and management tools that have legal standing – including listed Threatened Ecosystems and Bioregional Plans.

National Environmental Management: Protected Areas Act (Act 57 of 2003, as amended)

The Protected Areas Act provides for the formal protection of a network of ecologically viable areas that are representative of South Africa's biodiversity and natural landscapes. It establishes a consistent set of legal requirements for the management of national, provincial and local protected areas, and aims to balance the relationships between biodiversity conservation, human settlement and economic development. The Protected Areas Act allows for the declaration of a protected area on private or communal land and for the landowner to be recognised as the management authority of the protected area.

Spatial Planning and Land Use Management Act (Act 16 of 2013)

SPLUMA was enacted to provide a framework for spatial planning and land use management in the Republic. It is also aimed at, *inter alia*, the sustainable and efficient use of land. Development principles, norms and standards in terms of SPLUMA will guide decisions taken by the various authorities involved in the implementation of SPLUMA. The national and provincial spheres of government and each municipality will be required to prepare spatial development frameworks that represent the spatial development vision of the responsible sphere of government and competent authority. A municipality will be required to adopt a single land use scheme for its entire area within five years of the commencement of SPLUMA, which will include categories of land zoning and will be required to take into account environmental management instruments. These schemes must give effect to a spatial development framework and must promote efficient land development and the minimal impact on public health, the environment and natural resources.

World Heritage Convention Act (Act No. 49 of 1999)

The WHCA provides for the cultural and environmental protection and sustainable development of, and related activities in a world heritage site.

National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)

The NEMA:ICMA establishes a system of integrated coastal and estuarine management in the Republic; ensures that development and the use of natural resources within the coastal zone is socially and economically justifiable and ecologically sustainable; determines the responsibilities of organs of state in relation to coastal areas; controls dumping at sea and pollution in the coastal zone; and gives effect to South Africa's international obligations in relation to coastal matters.

Minerals and Petroleum Resources Development Act (Act 28 of 2002)

The MPRDA aims to ensure ecologically sustainable development of mineral and petroleum resources and to promote economic and social development.

National Water Act (Act No. 36 of 1998)

The NWA provides that the National Government is the public trustee of the National's water resources and acting through the Minister of Water & Environmental Affairs, has the power to regulate the use, flow and control of all water in the Republic.

Mountain Catchment Areas Act (Act 63 of 1970)

The MCA provides for the conservation, use, management and control of Mountain Catchment Areas. The management of Mountain Catchment Areas will maintain sustained yields of quality streamflow, nature conservation, fire hazard reduction, afforestation, grazing, tourism and recreational opportunity. The owner of the designated land must manage that land through prevention of soil erosion, removal of exotic vegetation and fire protection.

Conservation of Agricultural Resources Act (Act 43 of 1983)
CARA provides for control over the utilization of the natural agricultural resources in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

Environmental Conservation Act (Act 73 of 1983)
The ECA provides for the effective protection and controlled utilization of the environment and for matters incidental thereto.

National Forests Act (Act 84 of 1998)
The aim of the NFA is to reform the law on forests; to repeal certain laws; and to provide for related matters.

National Veld and Forest Fire Act (Act 101 of 1998)
The aim of the NVFFA is to provide for fundamental reform of the law relating to water resources; to repeal certain laws; and to provide for matters connected therewith.

Local Government: Municipal Systems Act (Act 32 of 2000)
The MSA prescribes the drafting of an integrated development plan for each municipality. It also addresses a spatial development framework that would form the basis for land use management in the jurisdictional area of the municipality. The integrated development plan guides all planning and development within a municipality.

Western Cape Land Use Planning Act (Act 3 of 2014)
The Western Cape Land Use Planning Act aligns with the national framework legislation (SPLUMA) and was promulgated to consolidate legislation in the province pertaining to provincial planning, regional planning and development, urban and rural development, and the regulation, support and monitoring of municipal planning. With the implementation of LUPA, all land use planning applications will be submitted and processed in terms of each municipality's by-law on Municipal Land Use Planning. Provincial development management and the effect of land development on agriculture are regulated in LUPA which provides for a land development approval by the Western Cape Government.

National Protected Areas Expansion Strategy (NPAES, 2008)
South Africa's first NPAES was published in 2008, with the goal of achieving cost-effective expansion of the protected area network that enhances ecological sustainability and resilience to climate change. It was in part a response to the National Spatial Biodiversity Assessment, 2004, which highlighted that many ecosystems in South Africa were under-protected. The NPAES sets national-scale ecosystem-specific targets for protected area expansion across the country, identifies geographic focus areas for land-based protected area expansion, and makes recommendations about mechanisms for protected area expansion. It serves as the over-arching framework and catalyst for the development of provincial protected area expansion strategies.

The National Biodiversity Framework (NBF, 2008)
The Biodiversity Act requires the Minister of Environmental Affairs to develop a National Biodiversity Framework and to review it every five years. The first NBF was published in 2008, informed by the NSBA (2004) and the National Biodiversity Strategy and Action Plan (NBSAP 2005). The purpose of the NBF is to co-ordinate and align the efforts of the organisations and individuals involved in conserving and managing South Africa's biodiversity. While the NBSAP is comprehensive and long-term, the NBF focuses on the most urgent strategies and actions

that can make the biggest difference in the shorter term. The NBF 2008 identified 33 priority actions for the period 2008–2013, organised under five strategic objectives. These provide a high-level framework for prioritising conservation action within the provincial context. The NBF will be revised, following the review of the NBSAP (which was initiated in 2013).

Western Cape Protected Areas Expansion Strategy (2015-2020)

The Western Cape Protected Areas Expansion Strategy addresses the formal proclamation of priority natural habitats as protected areas to secure biodiversity and ecosystem services for future generations. This strategy is aligned to the concepts and goals of the 2008 National Protected Areas Expansion Strategy, but does identify some different spatial priorities. The primary focus of the Western Cape Strategy is: to expand the Western Cape protected area network to encompass a more representative and resilient suite of areas that support biodiversity and ecological infrastructure, especially those threatened species and ecosystems that remain as yet unprotected; and to regularise existing protected areas, so that environmental security is ensured for everyone in South Africa and the costs and benefits of protection accrue to the appropriate entity.


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Western Cape Provincial Biodiversity Strategy and Action Plan (PBSAP)

The PBSAP is a ten-year strategy that aligns with the National and Provincial Medium Term Strategic Frameworks 2014–2019 as well as the National Biodiversity Strategy and Action Plan (NBSAP), 2015 to 2025. It integrates South Africa's obligations under the Convention on Biological Diversity (CBD) into the provincial context. The PBSAP is a strategic framework which prioritises and coordinates the collective efforts of the DEA&DP and CapeNature, relevant government departments and entities, municipalities, partners and the local community to ensure that biodiversity and ecological infrastructure in the province is optimally conserved, sustainably utilised and that benefits are equitably shared. PBSAP Overarching Goal: *By 2025 management, consolidation and expansion of all the categories of the Western Cape Province's network of conservation areas; promotion of existing and new biodiversity mainstreaming and conservation initiatives; enabling of an inclusive and sustainable biodiversity based economy; and active participation of citizens, progressively contribute to the attainment of biodiversity conservation, economic and development vision of the Western Cape Province*.

Western Cape Biodiversity Bill (in progress)

In terms of provincial legislation, it is intended that the Western Cape Biodiversity Act (currently a Bill) will address the implementation of the provincial spatial biodiversity plan. The Western Cape Biodiversity Act will repeal the Nature Conservation Ordinance of the Cape of Good Hope (Ordinance 19 of 1974), the Western Cape Nature Conservation Board Act (Act 15 of 1998) and the Western Cape Nature Conservation Laws Amendment Act (Act 3 of 2000) which is currently the relevant legislation enacted on a provincial level in terms of biodiversity conservation and the governance of CapeNature.

5.3 Glossary of Terms

Biodiversity: The wide variety of plant and animal species in their natural environment. It not only refers to species (plants, animals and micro-organisms), but also to ecosystems and landscapes, and the ecological and evolutionary processes that allow biodiversity to persist over time. It includes the diversity within species, between species, and of ecosystems.

Biodiversity Offsets: Conservation activities intended to compensate for the residual, unavoidable harm to biodiversity caused by development projects. It usually involves setting aside land in a similar ecosystem elsewhere, at the cost of the developer.

Biodiversity Pattern is the term for the way in which the components of biodiversity are spatially arranged. In this document, it refers to specific vegetation types or habitat types, e.g. forest or fynbos; a population of rare and endemic species; or other biodiversity features, e.g. a river or wetland (vlei). The habitat type or feature is home to specific animals, plants, birds, insects and other organisms, for example Blue Duiker in forests.

Biodiversity Plan (ning): A map of information about biodiversity features (species, ecosystems, ecological processes); existing protected areas; current patterns of land use; and potential and conflicting patterns of land use. These mapped features can be linked for further analysis using Geographic Information Systems (GIS) to identify areas of highest biodiversity importance and to determine priority areas for action.

Biodiversity Sector Plan: A tool which feeds into a range of multisectoral planning and assessment processes to inform land use planning and decision-making. As a minimum, products should include a Biodiversity Sector Plan handbook including the land use management guidelines and biodiversity profile for the municipality; a Critical Biodiversity Areas Map; and all relevant GIS shapefiles. The Biodiversity Sector Plan is the precursor to a gazetted bioregional plan.

Biodiversity Threshold (also referred to as a target): A threshold (target) is that point at which the existence of an ecosystem or biodiversity feature becomes threatened. It can be represented by a number (e.g. 52 individuals of a species) or size (e.g. 102 hectares of an ecosystem type) and represents the absolute minimum of that ecosystem or species which is required to be safeguarded in order to ensure the continued persistence of the ecosystem or species. If the threshold for a feature is exceeded (i.e. the extent of the feature is reduced through human activities), the threat arises that ecosystems will deteriorate/collapse, which will severely impact on the delivery of ecosystem services. These thresholds are determined through robust scientific calculations.

Bioregion: A land and water territory, the limits of which are not politically bound, but which are defined by the geographical boundaries of human communities and ecological systems. Also a geographical space that contains one whole, or several nested, ecosystems characterised by landforms, vegetative cover, human culture and history (as identified by local communities, governments and scientists).

Bioregional Plan (published in terms of the NEM:BA): A bioregional plan is based on a systematic biodiversity plan (ideally at a scale of 1:50 000 or finer), and includes a Critical Biodiversity Areas Map and land- and resource-use guidelines. The purpose of a bioregional plan is to inform land use planning, environmental assessment and authorisations, and natural resource management by a range of sectors whose policies and decisions impact on biodiversity. Refer to 'Guideline regarding the determination of bioregions and the preparation of and publication of bioregional plans'. Government Gazette No 32006, 16 March 2009.

Bioregional planning refers to land use planning and management that promotes sustainable development by recognising the relationship between, and giving practical effect to, environmental integrity, human-well-being and economic efficiency within a defined geographical space, the boundaries of which are determined in accordance with environmental and social criteria. It is an internationally recognised planning concept aimed at achieving sustainable development.

Cape Floristic Region (CFR): The Cape Floristic Region is a region of 90 000 km2 that extends from Nieuwoudtville southwards to Cape Town and then eastwards to Grahamstown. Most of this vast region is covered in fynbos, while the remaining areas are covered in renosterveld, forest, succulent karoo or thicket. The region holds close to 9 000 plant species, most of which grow in fynbos vegetation. The region coincides with the area known as the Cape Floral Kingdom that originates from an old system of classification which divided the world into six major plant kingdoms, based on their number of endemic plant families, genera and species, and which recognised the Cape as the smallest in area, yet one of the richest in species. The Kingdom concept is considered outdated by modern botanists, but it still holds charm amongst plant enthusiasts.

Conservation Areas (In the context of this document): Land under some form of conservation agreement other than those via the National Environmental Management: Protected Areas Act (NEM:PAA). They are not considered formally protected areas, as they are not gazetted in terms of the NEM:PAA and do not allow for long term security of tenure. For example Private Nature Reserves declared in terms of provincial ordinances, Biodiversity Agreements in terms of the NEM:BA, and conservancies.

Critical Biodiversity Areas (CBA): These are terrestrial (e.g. threatened vegetation type remnants) and/or aquatic features (e.g. vleis, rivers and estuaries), and the buffer areas along aquatic CBA features, whose safeguarding is critically required in order to meet biodiversity pattern and process thresholds. They are identified through a systematic biodiversity planning approach (see below) and represent the most land-efficient option to meeting all thresholds.

Ecological Process: Natural actions which occur within ecosystems and maintain them as working systems. Ecosystems work because they are kept "alive" by ecological processes such as pollination, nutrient cycling, natural disturbance (e.g. fire, grazing), migration of species, and soil maintenance. Other examples of processes include plant-herbivore processes, lowland to upland gradients, predator-prey relationships, migration and exchange between inland and coastal systems (often along river corridors), seasonal migration of animals, and hydrological regimes.

Ecological Support Area (ESA): A supporting zone or area required to prevent the degradation of Critical Biodiversity Areas and protected areas. They can be aquatic features, e.g. specific river reaches which feed into aquatic Critical Biodiversity Areas; or terrestrial features, e.g. the riparian habitat surrounding and supporting aquatic Critical Biodiversity Areas, and are often vital for delivering ecosystem services.

Ecosystem: The system of relationships and interactions between living components of biodiversity and the non-living environment (soil, water). An ecosystem can operate at any scale from very small (e.g. a small pond), to an extensive landscape (an entire mountain water catchment area).


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Ecosystem Services: The benefits that people get from nature (ecosystems), such as a regular supply of clean water, flood control, prevention of erosion, pollination (important to the fruit industry, for example), carbon storage (to counteract global warming), stone and sand for building, and clean air vital for our survival. In other words, ecosystem services is 'what nature does for us'.

Ecosystem Status: This describes the condition of an area's biodiversity relative to past, present and future threats, and is an indicator of the level of safeguarding required for the continued existence of the biodiversity occurring in that particular area. The ecosystem status of terrestrial ecosystems is based on the degree of habitat loss that has occurred in each ecosystem, relative to two thresholds: one for maintaining healthy ecosystem functioning, and one for conserving the majority of species associated with the ecosystem. As natural habitat is lost in an ecosystem, its functioning is increasingly compromised, leading eventually to the collapse of the ecosystem and to the loss of species associated with that ecosystem. Four Ecosystem status classifications types exist, namely Critically Endangered, Endangered, Vulnerable and Least Threatened.

Endemic (vs. Indigenous): A plant or animal species, or a vegetation type, which is naturally restricted to a particular defined region. Endemism implies a level of restricted occurrence, i.e. found nowhere else but in that region. The term 'endemic' should however not be confused with the term 'indigenous'. Indigenous implies that the plant or animal species, or a vegetation type is originally/naturally from that area. For example, if a plant occurs naturally only within South Africa, it implies that the plant is endemic to South Africa (restricted to here) as well as indigenous (naturally occurring here) to South Africa. If however a plant grows across the entire African continent, the plant will be indigenous to South Africa but not be endemic to South Africa.

Fine-Scale Biodiversity Plans are maps of biodiversity priority areas prepared using a systematic biodiversity planning approach for application at a scale of 1:5 000 to 1:50 000 (or finer), and which identify important areas for conservation and sustainable management. (See 'systematic biodiversity plan' below.)

Fynbos Forum Ecosystem Guidelines: A handbook that provides a set of guidelines prepared for several Western Cape ecosystem groups, e.g. Lowland Fynbos, Coastal Ecosystems. Its aim is to assist all stakeholders involved in land use planning and environmental assessment with integrating biodiversity into these procedures. Available from the BGIS Unit on (021) 799–8738, or downloadable from www.bgis.sanbi.org.

GIS, GIS layers and GIS shapefiles: A Geographic Information System (GIS) is a computer technology that combines geographic data (the location of man-made and natural features on the earth's surface) and other types of information (names, classifications, addresses and much more) to generate visual maps and reports. A GIS can play a major role in integrating information from a variety of databases to identify problems and explore solutions (Adapted from Looney 2000 Beyond Maps – GIS and Decision-making in Local Government). A GIS shapefile (or GIS layer) is an electronic picture of geographically mapped features (e.g. dams, roads, etc.) which are used in a GIS.

Indigenous (vs. Endemic): Naturally occurring or "native" to an area. See 'endemic' above for distinction between the two terms.

Invasive alien species: Invasive alien species means any nonindigenous plant or animal species whose establishment and spread outside of its natural range threatens natural ecosystems, habitats or other species (or has the potential to threaten ecosystems, habitats or other species); and may result in economic or environmental harm, or harm to human health.

Land cover: Refers to the class of substance which covers the land, e.g. natural vegetation, roads, factory, or bare ground. In the context of this document, land cover gives an indication of the level of transformation of natural ecosystems and can range from natural through to irreversibly transformed. Land cover cannot always be equated to land use, e.g. bare land can either be borrow pits (where the land use is mining) or natural bare soil (where the land use may be conservation).

Land use planning and decision-making (LUPDM): Land use planning and decision-making takes the form of both reactive decision-making and proactive planning. The former refers to decisions and recommendations made by authorities and professionals dealing with development applications (EIA and LUPO); while the latter refers to the compilation of forward planning documents and maps, such as SDFs, Strategic Environmental Assessments etc. that guide land use development. LUPDM is a multi-sectoral planning process.

Mainstreaming biodiversity means integrating biodiversity considerations into the policies, strategies and day-to-day operations of a range of sectors whose core business is not biodiversity conservation. Mainstreaming biodiversity is essential for overcoming the "conservation versus development" mindset, and for ensuring sustainable development.

Protected Areas: These are formally protected areas declared in terms of the National Environmental Management: Protected Areas Act. See also Conservation Areas above.

Ramsar Convention and List: Known as the 'Convention on Wetlands of International Importance', where certain wetlands have been listed and have acquired a new status at the national level and are recognised by the international community as being of significant value not only for the country, but for humanity as a whole (See www.ramsar.org)

Red Data species: All known plant or animal species that have been assessed and classified according to their potential for extinction in the near future by application of the IUCN Threat Assessment Criteria. This classification has the following categories: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened and Least Concern. The terms Red Data species or Red data listed species or threatened species are however colloquially used to refer to species which are Extinct, Extinct in the Wild, Critically Endangered, Endangered or Vulnerable. These species are protected by law under provincial ordinances, the NEMA, and the NEM:BA.

Spatial Planning Categories are delineated in the landscape into Core 1, Core 2, Buffer 1 and Buffer 2, as per the Western Cape Provincial SDF (2014). They represent the level of importance of biodiversity attached thereto and include land use recommendations based on the principles of bioregional planning (see above). They are intended to manage activities in the four main physiographic components of the Western Cape.

Species of Special Concern in this handbook refer to threatened species, endemic, scarce and nationally protected species. Species of Special Concern are also referred to as Species of Conservation Concern.

Sustainable development: Development that meets the needs of both present and future development, equitably. In terms of the NEMA, "(sustainable) development is the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations."

Systematic biodiversity plan (also known as a systematic conservation plan): A map which indicates priority areas for conservation and sustainable management to ensure the continued existence of biodiversity. Systematic biodiversity planning is an approach to conservation that prioritises actions by setting quantitative thresholds for biodiversity features (e.g. vegetation types). It is premised on conserving a representative sample of biodiversity pattern, including species and habitats (the principle of representation), as well as the ecological and evolutionary processes that maintain biodiversity over time (the principle of persistence). The configuration of priority areas identified in the plan is designed to be spatially efficient (i.e. to meet biodiversity thresholds as efficiently as possible in terms of the amount of land required) and where possible to avoid conflict with other land uses where these are known to exist (principles of efficiency and conflict avoidance). It recognises that the whole landscape must be planned and managed strategically to ensure sustainable development.

Threatened Ecosystem: An ecosystem type that has been classified as Critically Endangered, Endangered, or Vulnerable, based on an analysis of ecosystem threat status. A threatened ecosystem has lost or is losing vital aspects of its composition, structure, or function.

Urban Edge: An urban edge is 'a defined line drawn around an urban node as a growth boundary, i.e. the outer limit of urban areas'. It is intended to protect the rural environment from urban sprawl and to encourage efficient settlement patterns. Refer to the DEA&DP Guideline Document 'Urban Edge Guidelines in the Western Cape'.

Vegetation Type: Vegetation types are mapped at a scale smaller than a Biome, based on vegetation and landscape features, geology and soils, climate, and important taxa.

Vegetation Unit: Vegetation units are defined as 'a complex of plant communities ecologically and historically occupying habitat complexes at the landscape scale'. Vegetation units share general ecological properties such as position on major ecological gradients and nutrient levels, and appear similar in vegetation structure and composition.

Water Management Area: South Africa is divided into a number of Water Management Areas (WMAs), according to the National Water Act (Act No. 36 of 1998). A WMA is an area established as a management unit under the national water resource strategy within which a catchment management agency will conduct the protection, use, development, conservation, management and control of water resources.

Zoning and Zoning Schemes: The general purpose of zoning is to determine use rights, manage urban growth, develop and utilise land, as well as to conserve the natural and cultural environment.

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5.6 Appendix 1: Guidelines on EIA recommendations for taxa of conservation concern found on proposed development sites

Status	Criterion	Guideline for Recommendation
Critically Endangered	PE (possibly extinct)	No further loss of natural habitat should be permitted as the taxon is on the verge of extinction.
Critically Endangered	A, B, C, D	No further loss of natural habitat should be permitted as the taxon is on the verge of extinction.
Endangered	B, C, D	No further loss of habitat should be permitted as the taxon is likely to go extinct in the near future if current pressures continue. All remaining subpopulations have to be conserved if this taxon is to survive in the long term.
Endangered	Listed under A only	If this taxon has a restricted range, EOO < 2 000 km^2, recommend no further loss of habitat. If range size is larger, the taxon is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable, known subpopulation is formally conserved in terms of the NEM:PAA, and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Vulnerable	D	This taxon either constitutes less than 1 000 individuals or is known from a very restricted range. No further loss of habitat should be permitted as the taxon's status will immediately become either Critically Endangered or Endangered, should habitat be lost.
Vulnerable	B, C	The taxon is approaching extinction but there are still a number of subpopulations in existence. Recommend no further loss of habitat as this will increase the extinction risk of the taxon.
Vulnerable	Listed under A only	If this taxon has a restricted range, EOO < 2 000 km^2, recommend no further loss of habitat. If range size is larger, the taxon is possibly long lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable, known subpopulation is formally conserved in terms of the NEM:PAA, and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Data Deficient	D	This taxon is very poorly known, with insufficient information on its habitat, population status or distribution to assess it. However, it is highly likely to qualify as threatened. If a Data Deficient taxon will be affected by a proposed activity, the subpopulation should be well surveyed and the data sent to the Threatened Species Programme. Assessments will be repeated and the new status of the taxon, with a recommendation, will be provided within a short timeframe.

Data Deficient	T	There is uncertainty regarding the taxonomic status of this taxon, but it is likely to be threatened. Contact the taxonomist working on this group to resolve its taxonomic status; status will then be reassessed by the Threatened Species Programme.
Near Threatened	D	Currently known from fewer than 10 locations, therefore preferably recommend no loss of habitat. Should loss of this taxon's habitat be considered, then an offset that includes conserving another viable subpopulation (in terms of the NEM:PAA) should be implemented, provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Near Threatened	B, C	The taxon is approaching thresholds for listing as threatened but there are still a number of subpopulations in existence and therefore there is need to minimise loss of habitat. Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Near Threatened	Listed under A only	If this taxon has a restricted range, EOO < 2 000 km^2, then recommend no further loss of habitat. If range size is larger, the taxon is possibly long lived but widespread, and limited habitat loss may be considered. Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant biodiversity conservation plan or (iii) on a site associated with additional ecological sensitivities.
Critically Rare		This is a highly range-restricted taxon, known from one site only, and therefore no loss of habitat should be permitted as it may lead to extinction of the taxon. The National Threatened Species Programme is not aware of any current threats to this taxon.
Rare		This taxon is likely to have a restricted range, or be highly habitat specific, or have small numbers of individuals, all of which makes it vulnerable to extinction should it lose habitat. Recommend no loss of habitat. The National Threatened Species Programme is not aware of any current threats to this taxon.
Declining		This taxon is declining but the population has not yet reached a threshold of concern; limited loss of habitat may be permitted. Should the taxon be a known medicinal species and if individuals will not be conserved in situ, plants should be rescued and used as mother stock for medicinal plant cultivation programmes.

5.7 Footnotes

1. http://biodiversityadvisor.sanbi.org/wp-content/uploads/2014/07/2013_Ecological-infrastructure-factsheet.pdf
2. Guideline regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans. April 2008. Government Gazette No. 32006, 16 March 2009.
3. Policy Number 44854, 19 August 2015.
4. South Africa's National Biodiversity Framework, 2008. Minister of Water and Environmental Affairs, Government Gazette No. 32474, 3 August 2009.
5. http://www.gov.za/sites/www.gov.za/files/Outcome%2010%20Delivery%20Agreement%2023%20September2010_1.pdf
6. The South African National Land-Cover Dataset 1994 (NLC 1994; Fairbanks *et al.* 2000) and the South African National Land-Cover Dataset 2000 (NLC 2000; Van den Berg *et al.* 2008), respectively.
7. Government Gazette 34809, No. 1002. National list of ecosystems that are threatened and in need of protection. National Environmental Management: Biodiversity Act, 9 December 2011.
8. Western Cape Provincial Spatial Development Framework. 2014. URL: https://www.westerncape.gov.za/eadp/content/2014-provincial-spatial-development-framework-psdf
9. http://bgis.sanbi.org/
10. Department of Environmental Affairs and Tourism. 2009. Guideline regarding the Determination of Bioregions and the Preparation of and Publication of Bioregional Plans. Government Gazette No. 32006. Published in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Government Printer, Cape Town.
11. Pence, G.Q.K. 2017. The Western Cape Biodiversity Spatial Plan: Technical Report. Unpublished report. Western Cape Nature Conservation Board (CapeNature), Cape Town.
12. Mucina & Rutherford. 2012. Vegetation map (http://www.bgis.sanbi.org)
13. Vlok. 2014. Fine-scale vegetation maps (http://www.bgis.sanbi.org)
14. Harris. 2015. Integrated Coastal Habitat map (http://www.bgis.sanbi.org)
15. Technically, 40 ecosystems (of 160 assessed) did not meet targets, but 19 of these are Critically Endangered ecosystems – meaning that they do not have sufficient habitat remaining to meet targets without extensive restoration. These ecosystems can be said to have a 'stock' deficit, whereas the other 21 ecosystems still have 'stock' left to protect.
16. SANBI's 2009 National Land Cover Mosaic is a patchwork of best-available data. It uses the National Land Cover of 2000 (NLC 2000) as a base layer, supplemented by more recent data where available; for example, DAFF's field crop boundaries (2007), Eskom's SPOT5 building count data (2005/6), and C.A.P.E. Fine-Scale Biodiversity Planning project land cover data (2005/6). The NLC 2000 was, however, the last land cover dataset to completely cover the Western Cape Province. For significant portions of the province best available data therefore reflect conditions on the ground 14 years ago, at 30m resolution and with a final map accuracy of 65.8%. Interestingly, an overall mapping accuracy of 80% is now generally required by the Chief Directorate of National Geospatial Information.
17. Proposed Standard Draft Zoning Scheme By-law for the Western Cape, 2017.
18. Note that a revised version of the Provincial Guideline on Biodiversity Offsets is expected and should be used as soon as it becomes available.
19. https://www.environment.gov.za/sites/default/files/docs/discussiondocument_environmentaloffsets.pdf An updated version (December 2016) is available on request from CapeNature.

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