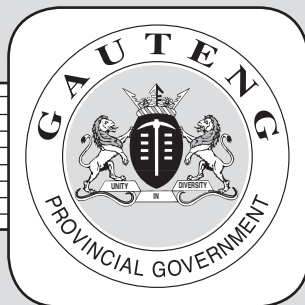


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GENERAL NOTICES • ALGEMENE KENNISGEWINGS

NOTICE 2684 OF 2015**GAUTENG PROVINCE**
AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA**GENERAL NOTICE****DETERMINATION OF BIOREGIONS AND PUBLICATION OF
BIOREGIONAL PLANS UNDER SECTION 40(1) OF THE
NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY
ACT 10 OF 2004**

I, Lebogang Maile, MEC for Economic Development, Environment, Agriculture and Rural Development, hereby determine the areas of jurisdiction of the following municipalities as bioregions:

1. West Rand District Municipality
2. Ekurhuleni Metropolitan Municipality

The bioregional plan for the West Rand District Municipality is attached as Schedule 1 to this notice, and the bioregional plan for the Ekurhuleni Metropolitan Municipality is attached as Schedule 2 to this notice.


LEBOGANG MAILE (MPL)**MEC FOR ECONOMIC DEVELOPMENT, ENVIRONMENT, AGRICULTURE AND
RURAL DEVELOPMENT**

Bioregional Plan for the West Rand District Municipality



Compiled by

West Rand District Municipality

November 2011, revised March 2014

Executive Summary

This Bioregional Plan covers the West Rand District Municipality. The West Rand District is the developer and primary implementing agent of the Bioregional Plan. The spatial component of the Bioregional Plan is based on systematic biodiversity planning that was undertaken by the Gauteng Department of Agriculture and Rural Development (GDARD).

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. This is done by providing a map of biodiversity priority areas, including Critical Biodiversity Areas and Ecological Support Areas, with accompanying land-use planning and decision-making guidelines.

The West Rand District Municipality falls within the Grassland biome, and is home to a disproportionately high percentage of rare and threatened species and threatened ecosystems. A high proportion of South Africa's mining activity, heavy industry, commercial enterprise and urban settlement occurs in the region. Consequently, the pressures placed on the environment and the remaining natural ecosystems are very high, and opportunities for conservation of biodiversity are limited. These factors together make a bioregional plan an appropriate tool for addressing the pressures on biodiversity in the District.

There are at least 12 threatened plant species and 20 threatened animal species in the West Rand District, and eight nationally listed threatened ecosystems. Aquatic ecosystems are equally unique in the bioregion, with 83% of wetland types and 39% of river types in the District listed as threatened. Just under two thirds of the District is in a natural or near-natural state (63%), with urban areas (6%), intensive agriculture (28%) and mining (3%) together covering 37% of the District. Critical Biodiversity Areas cover 27.5% of the District; with CBA 1 (natural or near-natural state) covering 27%, and CBA 2 (highly modified landscapes which retain importance for threatened species) covering 0.5%. Ecological Support Areas cover a further 19% of the District; with ESA 1 (natural, near-natural or degraded state) covering 13% and ESA 2 (highly modified landscapes which retain importance for ecological processes) covering 6%. Protected areas cover just over 2% of the West Rand District.

This Bioregional Plan is based on Critical Biodiversity Areas identified and described in the Gauteng C-Plan v3.3, a systematic biodiversity plan developed by GDARD. The Bioregional Plan is aligned with other relevant spatial plans for the district. The Bioregional Plan is consistent with the National Environmental Management: Biodiversity Act, and meets all the requirements of the Guideline Regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans. There is a wide range of mandatory and recommended users of bioregional plans, including: local, provincial and national government departments and authorities whose decisions and actions impact on biodiversity and the natural environment; national and provincial conservation agencies; environmental and planning consultants; conservation NGOs; and private landowners.

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Figure 3. Threatened wetland ecosystem types and river ecosystem types in the West Rand District identified in the National Freshwater Ecosystems Priority Areas Project (Nel *et al.*, 2011).

Figure 4. Land cover patterns in the West Rand District (GTI, 2009)

Figure 5. Ecosystem protection levels in the West Rand District.

Figure 6. Critical Biodiversity Areas and Ecological Support Areas for the West Rand District. See Table 7 for category definitions.

List of Abbreviations

CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs (National)
DEAT	former Department of Environmental Affairs and Tourism (National)
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIP	Environmental Implementation Plan
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ESA	Ecological Support Area
GIS	Geographic Information System
GDARD	Gauteng Department of Agriculture and Rural Development
GTI	Geo Terra Image
IDP	Integrated Development Plan
LUPO	Land-Use Planning Ordinance
MEC	Member of the Executive Committee
Metro	Metropolitan Municipality
NBA	National Biodiversity Assessment 2011
NEMA	National Environmental Management (Act 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NGO	Non-Governmental Organisation
NNR	No Natural Habitat Remaining
NPAES	National Protected Area Expansion Strategy 2008
ONA	Other Natural Area
PA	Protected Area
PE	Protected Environment
SANBI	South African National Biodiversity Institute
SEA	Strategic Environmental Assessment
SDF	Spatial Development Framework
WfW	Working for Water
WHS	World Heritage Site

Acknowledgements

Sections of this Bioregional Plan are adapted from the Bioregional Plan for the Nelson Mandela Bay Municipality produced by Warrick Stewart and Brian Reeves from SRK Consulting (Stewart and Reeves, 2010). The Biodiversity Sector Plans for Garden Route Initiative (Vromans, Maree, Holness, Job and Brown, 2010) and the Guideline Regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans (DEAT 2009) were also used extensively to guide the report structure and content. We would also like to acknowledge Pieta Compaan and Michelle Pfab, the primary authors of the Gauteng C-plan v3.3 (GDARD, 2013), which provides the West Rand District Bioregional Plan with a robust and defensible technical basis.

Preface

This Bioregional Plan was compiled by consultants Dr Stephen Holness and Andrew Skowno of ECOSOL GIS for the West Rand District Municipality. With support from Gauteng Department of Agriculture and Rural Development (GDARD) and financial support from the Grasslands Programme of the South African National Biodiversity Institute (SANBI). This Bioregional Plan was developed in 2010/2011 and is based on analyses performed, and data sets available at that time. The document was improved significantly by a review process in early 2014. One aspect of the analysis (ecosystem protection level categories) was updated in order to align the Bioregional Plan with the National Biodiversity Assessment: Terrestrial component (Driver, Sink, Nel, Holness, Van Niekerk, Daniels, Jonas, Majiedt, Harris, & Maze, 2012). The reference list was updated to reflect current publication statuses.

1 Part A: Introduction and Objectives

The West Rand District Municipality informed the Gauteng Province of their intention to declare a bioregion and publish a Bioregional Plan in 2011. This is the first bioregional plan for the area, and hence does not replace any existing bioregional plans. The proposed bioregion for the West Rand District forms part of a larger region covering the Province of Gauteng (Figure 1). Bioregional plans have been developed for each city, metro and district in the province, in a parallel process supported by GDARD and SANBI.

Gauteng Province is home to a high proportion of South Africa's mining activity, heavy industry, commercial enterprise and urban population. These activities and characteristics are all associated with land-use change and associated loss or degradation of natural habitats. The pressures placed on the environment and the remaining natural ecosystems are very high, and the loss of natural habitat and ecological processes is expected. Consequently, bioregional plans for each metro and district are appropriate tools for addressing the threats to biodiversity.

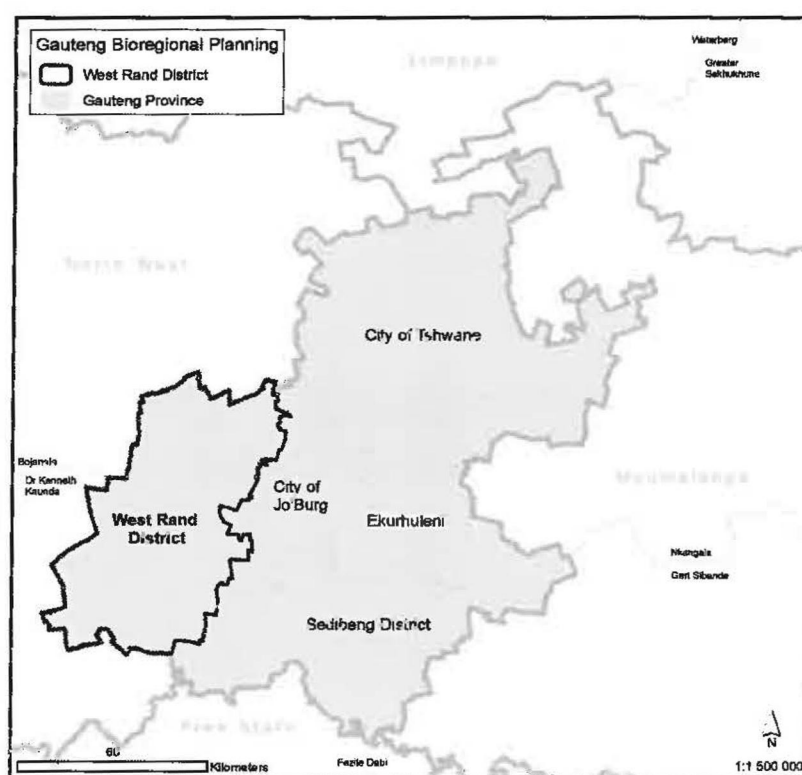


Figure 1. Context map showing the location of the West Rand District Municipality and the extent of the Gauteng Province.

1.1 Purpose and Objectives of the Bioregional Plan

Bioregional plans are one of a range of tools provided for in the National Environmental Management: Biodiversity Act (No. 10 of 2004 - hereafter referred to as the Biodiversity Act), that can be used to facilitate the management and conservation of biodiversity priority areas outside the protected area network. 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. This is done by providing a map of biodiversity priority areas with accompanying land-use planning and decision-making guidelines. Bioregional plans are intended to feed into a range of multi-sectoral planning and assessment processes such as Environmental Management Frameworks (EMFs), Spatial Development Frameworks (SDFs), Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs), and to support and streamline environmental decision-making. A bioregional plan is not in itself a multi-sectoral planning or assessment tool, but rather is the biodiversity sector's input into other planning and assessment processes.

This Bioregional Plan is consistent with National Environmental Management Act (No. 107 of 1998 - hereafter referred to as NEMA) principles and the Biodiversity Act. It is designed to support integrated development planning and sustainable development by identifying an efficient set of Critical Biodiversity Areas that are required to meet biodiversity objectives, in a configuration that is least conflicting with other land-uses and activities. Where alternatives are available, the Critical Biodiversity Areas are designed to avoid conflict with existing IDPs, EMFs and SDFs in the region by favouring the selection of sites that are least conflicting with other land-uses. The plan was developed in parallel with, and is deliberately designed to be compatible with, the West Rand District EMF.

1.2 Intended Users and Uses of the Bioregional Plan

Bioregional plans are aimed primarily at government and civil society sectors involved in land-use planning and decision-making. The users of the bioregional plan can be divided into **mandatory** users, i.e. those for whom it is a legal requirement to consider the bioregional plan; and **recommended** users, for example, those who will find it to be a useful informant in planning, environmental and development projects (Table 1).

The bioregional plan is the official reference for biodiversity priorities to be taken into account in land-use planning and decision-making by all sectors. The bioregional plan has three main uses:

1. Proactive forward planning, serving as an input into mechanisms such as EMFs, SDFs, IDPs, Metropolitan Open Space Systems and zoning schemes;
2. Reactive decision-making, providing guidance for evaluating environmental impact assessments, agricultural land and water-licensing decisions, and development control decisions through land-use legislation (e.g. rezoning, subdivision and planning approvals).
3. Proactive conservation, providing an input into decisions on the expansion of protected areas through land acquisition by the state and biodiversity stewardship agreements with private or communal landowners.

Table 1. Users of bioregional plans, divided into mandatory and recommended users.

Adapted from Nelson Mandela Bay Draft Bioregional Plan (Stewart & Reeves, 2010).

User		Mandatory uses	Recommended uses
West Rand District Municipality Mogale City Local Municipality Merafong City Local Municipality Randfontein Local Municipality Westonaria Local Municipality		Must align the Bioregional Plan with its Integrated development Plan (IDP) and Spatial Development Framework (SDF) and must demonstrate how the Bioregional Plan may be implemented. Must also take the Bioregional Plan into account in issuing planning authorisations.	Should integrate Critical Biodiversity Areas and other relevant guidelines and recommendations from the Bioregional Plan into Environmental Management Frameworks (EMFs) and zoning schemes).
Any organ of state that must prepare an Environmental Implementation Plan (EIP) or Environmental Management Plan (EMP) in terms of Chapter 3 of NEMA		Must consider the Bioregional Plan in developing the Environmental Implementation Plan or Environmental Management Plan.	
Environment or decision-makers who are required by section 2(1)(c) of NEMA to apply the NEMA section 2 principles in their decision-making	DEA - National Department of Environmental Affairs	Must consider the Bioregional Plan before issuing environmental authorisations on applications dealt with at a national level.	Should take the Bioregional Plan into account in their planning processes and in their programmes.
	GDARD – Gauteng Department of Agriculture and Rural Development	Must consider the Bioregional Plan before issuing environmental authorisations. Should take the Bioregional Plan and identified Critical Biodiversity Areas into account in their comments on applications.	Should take the Bioregional Plan into account when developing provincial supplements to the NEMA EIA regulations, developing EMFs and Provincial Guidelines in terms of EIA regulations. Should require that Environmental Assessment Practitioners (EAPs) refer to the Bioregional Plan in Basic Assessment Reports and Environmental Impact Reports. Should take Bioregional Plan into account in planning LandCare activities, farm planning, ploughing and subdivision applications, land reform and Arec- Wide Planning, and in the development of policy, legislation or guidelines for land-use planning and

		management.
	DAFF – National Department of Agriculture, Forestry and Fisheries	Should take the Bioregional Plan into account in their authorisations. Should take the Bioregional Plan into account in their planning processes and in their programmes.
	DME – National Department of Mineral and Energies	Should take the plan into account in their authorisations for prospecting and mining.
	DID – Gauteng Department of Infrastructure Development	Should take the Bioregional Plan into account when planning infrastructure.
	DRT – Department of Roads and Transport	Should take the Bioregional Plan into account when planning roads and other transport infrastructure.
	DLGH – Gauteng Department of Local Government and Housing	Should take the Bioregional Plan into account when identifying suitable sites for new housing developments.
Working for Water, Working for Wetlands, LandCare,		Should take the Bioregional Plan into account in planning and scheduling their activities
Environmental and planning consultants		Should take the Bioregional Plan into account when undertaking Strategic Environmental Assessments and Environmental Impact Assessments or when developing IDPs, SDFs or EMFs for a municipality
Conservation NGOs		Should use the Bioregional Plan to guide comments on land-use change applications, and to direct conservation initiatives
Private landowners		Should use the Bioregional Plan if they want more information about the biodiversity value of their landholdings
Private developers and businesses		Should facilitate their process of obtaining development rights by utilizing the Bioregional Plan to identify appropriate areas for different types of land-use in order to avoid unnecessary delays and costs associated with submitting inappropriate development proposals which are unlikely to be approved.

1.3 Underlying Biodiversity Plan and Limitations

This Bioregional Plan is based on Critical Biodiversity Areas designed and described in the Gauteng C-Plan v3.3 (GDARD, 2013), a systematic biodiversity plan developed by the Gauteng Department of Agriculture and Rural Development (GDARD). The Bioregional Plan serves as the primary biodiversity informant to a range of planning processes. However, it is important to recognise that the Bioregional Plan does not replace these planning and decision-making processes, and does not grant or limit land-use rights. Further, the Bioregional Plan has limitations, which although they do not restrict the application of the Bioregional Plan, need to be recognized and appropriately addressed when it is used:

1. The Bioregional Plan does not replace the need for site assessments, particularly for Environmental Impact Assessments. Although it is based on a fine-scale systematic biodiversity plan, this does not remove the need for on-site verification of the identified Critical Biodiversity Areas;
2. The underlying systematic biodiversity plan (Gauteng C-Plan v3.3), on which the Bioregional Plan is based, is designed to be used at a scale of approximately 1:50 000. Although it can be used at a finer scale, this requires specialist interpretation of the specific features identified in the systematic biodiversity plan;
3. The systematic biodiversity plan (Gauteng C-Plan v3.3), on which the Bioregional Plan is based, was developed using appropriate methods and uses the best available data at the time of its development. However, key aspects such as the distribution of threatened species remain incomplete.

Ongoing changes in land-use as well as changes in biodiversity, may impact on the identified network of Critical Biodiversity Areas. It is likely that additional areas would need to be designated as Critical Biodiversity Areas when the Bioregional Plan is revised due to these changes.

2 Part B: Biodiversity Profile

2.1 Significance of the Biodiversity within the Bioregion

The West Rand District contains a disproportionately high percentage of rare and threatened species and threatened ecosystems when compared with the rest of the Gauteng Province and with South Africa as a whole. This is due to the combination of its topographic and geological diversity resulting in a diversity of habitats (which in turn support a diversity of species) and the high level of habitat modification that characterises the bioregion.

2.2 Important Terrestrial Features

2.2.1 Threatened Species in the West Rand District

This section is not intended to be a comprehensive review of species found in the West Rand District, rather it is a summary of existing information available on threatened species and species of special concern.

- **Plants:** An examination of the threatened plant species records held within the National Herbarium Pretoria Computerised Information System (PRECIS), supplemented by provincial records, shows that 12 of the 42 Threatened plant species recorded for the Gauteng Province¹ occur in West Rand District Municipality. These include three Endangered and nine Vulnerable species. In addition there are a number of other plant species which are not Threatened nationally, but are still of local concern because they are listed as Near-Threatened, Rare or Declining (See Table 2).
- **Mammals:** Eight of Gauteng's mammal species of conservation concern are found in the West Rand District. These include the Endangered White-tailed Mouse and two Near-Threatened species, the Southern African Hedgehog and Spotted-necked Otter. A number of cave-dwelling bats of special concern are also found in the region. These include one Vulnerable species and four other Near-Threatened species (See Table 2).
- **Reptiles:** The globally Near-Threatened Striped Harlequin Snake (*Homoroselaps dorsalis*) is found in the province, but it is not known if its distribution range extends into the West Rand District.
- **Birds:** Eight Vulnerable species and four Near-Threatened species of birds are particularly reliant on the Gauteng region for suitable habitat, and a number of others also occur occasionally. A high proportion of these species of special concern are found in the West Rand District. These include 4 Vulnerable species that are partially or fully wetland-dependent, a further 5 species that are not specifically associated with wetlands, and 7 Near-Threatened species (See Table 2).
- **Invertebrates:** Gauteng is important for at least four threatened invertebrate species. Two of these, Stobbia's Fruit Chafer Beetle (*Ichneustoma stobbiai*) and the Highveld Blue Butterfly (*Lepidochrysops praeterita*), which are both likely to be listed as Vulnerable, are found in the West Rand District.
- **Other species of interest:** The charismatic Giant Bullfrog (*Pyxicephalus adspersus*), which is not listed as threatened globally but is listed as a Protected Species in South Africa, is found in wetlands of the West Rand District.

¹ Based on an analysis of Red Listed Plant species found within the Quarter Degree Squares overlapping the West Rand and the whole Gauteng Province.

Table 2: Species of plants, mammals and birds of conservation concern in West Rand District Municipality. Scientific names italicised, common English names, where known, are given in brackets).

	Name	Reason for concern
Plants	<i>Aloe peglerae</i> <i>Habenaria mossii</i> , <i>Lithops lesliei</i> subsp. <i>lesliei</i> var. <i>rubrobrunnea</i>	Endangered
	<i>Bowiea volubilis</i> subsp. <i>volubilis</i> , <i>Brachycorythis conica</i> subsp. <i>transvaalensis</i> , <i>Cheilanthes deltoidea</i> subsp. nov. Gauteng form, <i>Cineraria longipes</i> <i>Dioscorea sylvatica</i> , <i>Khadia beswickii</i> , <i>Ledebouria atrobrunnea</i> , <i>Melolobium subspicatum</i> , <i>Prunus africana</i> .	Vulnerable
	<i>Adromischus umbraticola</i> subsp. <i>umbraticola</i> <i>Boophane disticha</i> <i>Callilepis leptophylla</i> <i>Cineraria austrotransvaalensis</i> <i>Cleome conrathii</i> <i>Delosperma leendertziae</i> <i>Dioscorea sylvatica</i> <i>Drimia sanguine</i> <i>Frithia pulchra</i> <i>Gnaphalium nelsonii</i> <i>Gunnera perpensa</i> , <i>Habenaria barbertoni</i> <i>Habenaria kraenzliniana</i> <i>Holothrix randii</i> <i>Hypoxis hemerocallidea</i> <i>Ilex mitis</i> var. <i>mitis</i> <i>Kniphofia typhoides</i> <i>Stenostelma umbelluliferum</i> <i>Trachyandra erythrorrhiza</i>	Near-threatened, rare or declining
Mammals	<i>Myodomys albicaudatus</i> (White-tailed mouse)	Endangered
	<i>Rhinolophus blasii</i> (Blasius' /Peak-saddle horseshoe bat)	Vulnerable
	<i>Atelerix frontalis</i> (Southern African hedgehog) <i>Lutra maculicollis</i> (Spotted-necked otter) <i>Rhinolophus clivosus</i> (Geoffroy's Horseshoe Bat) <i>Rhinolophus hildebrandtii</i> (Hildebrandt's Horseshoe bat) <i>Miniopterus schreibersii</i> (Schreiber's long-fingered bat) <i>Myotis tricolor</i> (Temminck's Hairy bat)	Near-threatened
Birds	Wetland-dependent (full or partial): <i>Podica senegalensis</i> (African Finfoot) <i>Tyto capensis</i> (African Grass Owl) <i>Circus ranivorus</i> (African marsh Harrier) <i>Gorsachius leuconotus</i> (White-backed Night Heron) Non-wetland dependent: <i>Eupodotis senegalensis</i> (White-bellied Korhaan)	Vulnerable

	<i>Anthropoides paradiseus</i> (Blue Crane) <i>Falco naumanii</i> (Lesser Kestrel) <i>Polemaetus bellicosus</i> (Martial Eagle) <i>Gyps coprotheres</i> (Cape Vulture)	
	<i>Sagittarius serpentarius</i> (Secretary Bird) <i>Mirafra cheniana</i> (Melodius Lark) <i>Falco biarmicus</i> (Lanner Falcon) <i>Phoenicopus minor</i> (Lesser Flamingo) <i>Phoenicopus ruber</i> (Greater Flamingo) <i>Rostratula benghalensis</i> (Greater Painted Snipe) <i>Alcedo semitorquata</i> (Half-collared Kingfisher)	Near-threatened

2.2.2 Threatened Ecosystems

Ecosystem threat status refers to the degree to which an ecosystem is still intact, or alternatively losing vital aspects of its structure, function or composition, for example as a result of irreversible loss of natural habitat within that ecosystem. SANBI has developed a system for assessing ecosystem threat status that uses a suite of criteria to assign national ecosystem status to South African vegetation types. The list of threatened terrestrial ecosystems published by the Minister of Environmental Affairs in December 2011, in terms of the Biodiversity Act (hereafter referred to as the National Threatened Ecosystems List), is based largely on South African vegetation types and the degree to which they have been irreversibly modified. According to this list, the West Rand District has a total of eight threatened ecosystems, two of which are considered Critically Endangered, two Endangered and four Vulnerable (Table 3 & 4) (Figure 2). Although much of this habitat has now been irreversibly modified, the original extent of the threatened habitat types covers 55% of the West Rand District.

Table 3. Number of nationally listed threatened ecosystems occurring in the West Rand District and in Gauteng Province.

Number of Threatened Ecosystems	West Rand District	Gauteng Province
Critically Endangered	2	10
Endangered	2	7
Vulnerable	4	7
Total Threatened Ecosystems	8	24

Table 4. Extent in hectares (and percentage extent) of nationally listed threatened ecosystems occurring in the West Rand District and Gauteng Province.

Threatened Ecosystems	West Rand District (ha)	% Extent	Gauteng Province (ha)	% Extent
Critically Endangered	9733	4%	323438	20%
Blesbokspruit Highveld Grassland			92548	6%
Boesmanspruit Highveld Grassland			39715	2%
Bronberg Mountain Bushveld			12743	1%
Glen Austin Pan			458	<1%
Klipriver Highveld Grassland	116	<1%	88787	5%

Magaliesberg Pretoria Mountain Bushveld			10173	1%
Rietvleiriver Highveld Grassland			40207	2%
Roodepoort Reef Mountain Bushveld	9617	4%	13978	1%
Wilge Mountain Bushveld			6347	<1%
Witwatersberg Pretoria Mountain Bushveld			18481	1%
Endangered	50401	21%	234248	14%
Brakfontein Reef Bushveld			1680	<1%
Bronkhorstspuit Highveld Grassland			12814	1%
Deneysville Highveld Grassland			9034	1%
Egoli Granite Grassland	14774	6%	103557	6%
Kraanspoort Mountain Bushveld			12034	1%
Tsakane Clay Grassland			58834	4%
Witwatersberg Skeerpoort Mountain Bushveld	35628	15%	36296	2%
Vulnerable	75052	31%	609653	37%
Eastern Highveld Grassland			7447	<1%
Eastern Temperate Freshwater Wetlands	970	<1%	1654	<1%
Magaliesberg Hekpoort Mountain Bushveld	6029	2%	6029	<1%
Marikana Thornveld			93296	6%
Rand Highveld Grassland	12919	5%	168042	10%
Soweto Highveld Grassland	55135	22%	304401	18%
Springbokviakte Thornveld			28784	2%
Total Not Threatened Extent	110501	45%	487439	29%
Total Threatened Ecosystem Extent	135186	55%	1167339	71%
Total	245687	100%	1654779	100%

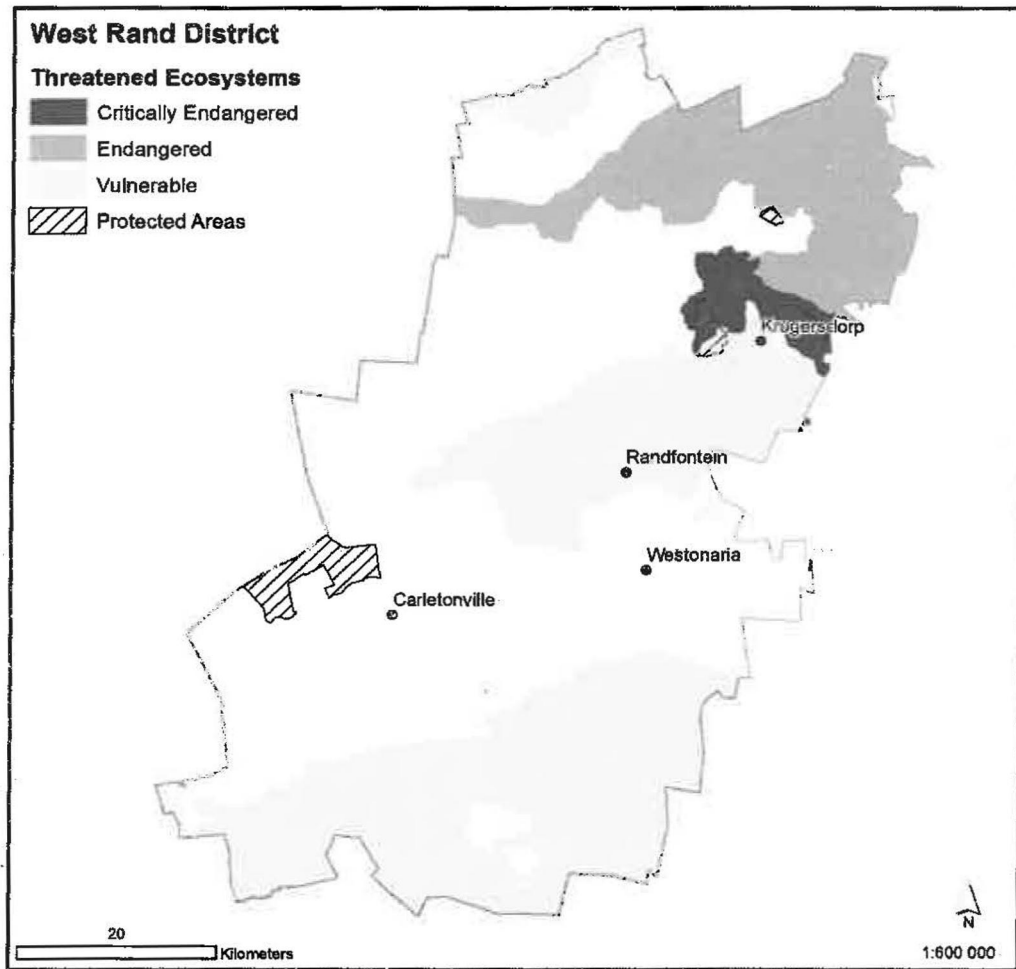


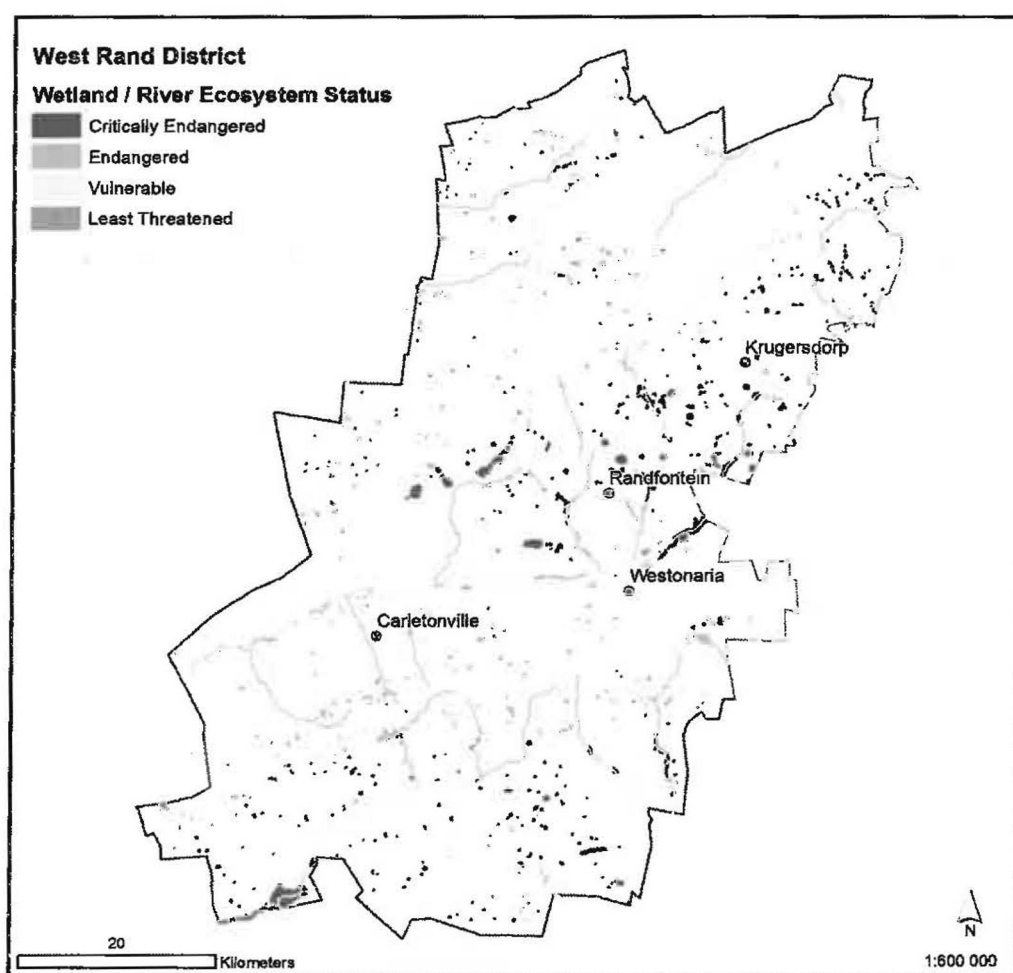
Figure 2. Nationally listed threatened ecosystems in the West Rand District. Refer to Table 3 for full list of nationally listed threatened ecosystems in the district.

2.3 Important Freshwater Features

The West Rand District contains a high diversity of river and wetland ecosystems. The National Freshwater Ecosystem Priority Areas (NFEPA) project (Nel *et al.*, 2011) identified 30 unique wetland types and 12 river types in the area (Table 5). The West Rand District contains a high proportion of South Africa's urban, industrial and mining activity, as well as significant areas of arable land, all of which hold the potential to impact negatively on the condition of hydrological systems. Impacts include changes in water quality (e.g. acid mine drainage, waste water from treatment plants, fertilizer and pesticide runoff) and water flow regimes (e.g. catchment hardening and increased storm water flows). Consequently, 83% of the wetland ecosystem types and 33% of the river ecosystem types are threatened (Driver and Nel, 2012 (Table 5, Figure 3).

Table 5. River and wetland ecosystem threat status in West Rand District

River and Wetland Threat Status	Number of Critically Endangered Types	Number of Endangered Types	Number of Vulnerable Types	Number of Least Threatened Types	Total
Wetlands	17	7	1	5	30
Rivers	0	0	4	8	12
Total	17	7	5	13	42

Figure 3. Threatened wetland ecosystem types and river ecosystem types in the West Rand District identified in the National Freshwater Ecosystems Priority Areas Project (Nel *et al.*, 2011).

2.4 Important Ecological Processes (including climate change mitigation and adaptation)

The West Rand District Municipality is also important for supporting a range of ecological processes which are critical for ensuring long term persistence of biodiversity and the delivery of ecosystem services, especially in the context of climate change. Protection of intact natural habitat in an ecologically viable configuration (as would be achieved by implementing the Bioregional Plan) should be the primary climate change adaptation approach taken by district authorities. Key ecological process issues include:

Hydrological processes: In addition to the importance of the aquatic ecosystem types outlined in the previous section, the area is important for supporting a range of key hydrological processes which are significant well beyond the boundaries of the bioregion. Hydrological changes in the Witwatersrand can impact much of the country through downstream impacts on the major Gariep and Limpopo river systems. Dolomite and wetland systems play a major role in controlling the hydrology of the region. Climate change impacts are likely to increase the value of maintaining intact or at least functioning hydrological systems.

Climate change mitigation: Forest, woodland, wetland, and even grassland systems, play an important role in carbon sequestration and protection of remaining intact areas of natural habitat is a priority. Keeping sufficient habitat intact is thus important for minimizing the long term magnitude of climate change events. Although the contribution of the district is small in a global context, it is important that all areas contribute to climate change mitigation.

Climate change adaptation: Ecological process Issues important for climate change adaptation include -

Corridors and connectivity: The high levels of habitat loss and urban infrastructure development in the Grassland biome in general, and the Gauteng Province in particular, significantly restrict connectivity of ecosystems at a national level. Gauteng can be seen as a key bottleneck or restriction in west-east connectivity, which can impact on the long term survival of a range of species and ecosystems in the context of ongoing climate change. Maintaining connectivity is critical for long term persistence of biodiversity in the face of ongoing climate change, and represents the major contribution which the Bioregion can make to facilitating climate change adaptation within the Gauteng Province and South Africa as a whole.

Climate change refugia and high diversity areas: The Gauteng biodiversity assessment process identified a number of key areas which represent high diversity of environmental parameters in relatively small areas. These high value areas exist because of the relatively large topographic and geological diversity of the region. These areas should be identified within a bioregional plan as they are critical for ensuring the long term persistence of both species and ecosystems, as they include both the ecological gradients required to allow species and habitats to adjust to climate change impacts and are likely to include refuge areas. In addition, ridges and higher altitude areas are important.

Areas for minimizing climate change impacts on society: Climate change is likely to result in significant increases in climate variability. In the urban context, perhaps the most important consequence is an increase in the likelihood of extreme flood events. Protection of intact natural

habitat (especially wetlands, floodplains and intact riparian habitat) is extremely important for reducing the magnitude of flood events as these areas play an important role in regulating hydrological processes such as storm runoff. In addition, these areas (especially floodplains) are extremely high risk for communities living in these areas, and ensuring that infrastructure and agricultural development is avoided where possible in high risk areas will reduce the long term impact of climate change, particularly on poor communities.

2.5 Patterns of Land-Use

According to the Gauteng land cover data (GTI, 2009), land cover patterns in the West Rand District are characterised by high levels of habitat loss and agricultural development with only 63% of the extent in a natural state and 37% severely or irreversibly modified (Table 6, Figure 4). Intensive agriculture covers 28% of the West Rand District, and mining and urban development 3% and 6% respectively. The overall levels of habitat loss for the Gauteng Province are significantly higher than for the West Rand District (44% vs. 37%).

Table 6. Land Cover Classes in the West Rand District and Gauteng Province. Extent in hectares (ha).

Land Cover Level 1	Level 2	West Rand District	% Extent	Gauteng Province	% Extent
Natural	Natural - Terrestrial	247317	61%	951308	52%
	Natural - Aquatic	10865	3%	70631	4%
Natural SubTotal		258182	63%	1021939	56%
Irreversible Modification	Intensive Agriculture	112901	28%	445606	25%
	Urban	26148	6%	291750	16%
	Mining	11511	3%	58538	3%
Irreversible Modification SubTotal		150560	37%	795894	44%
Total		408742		1817833	

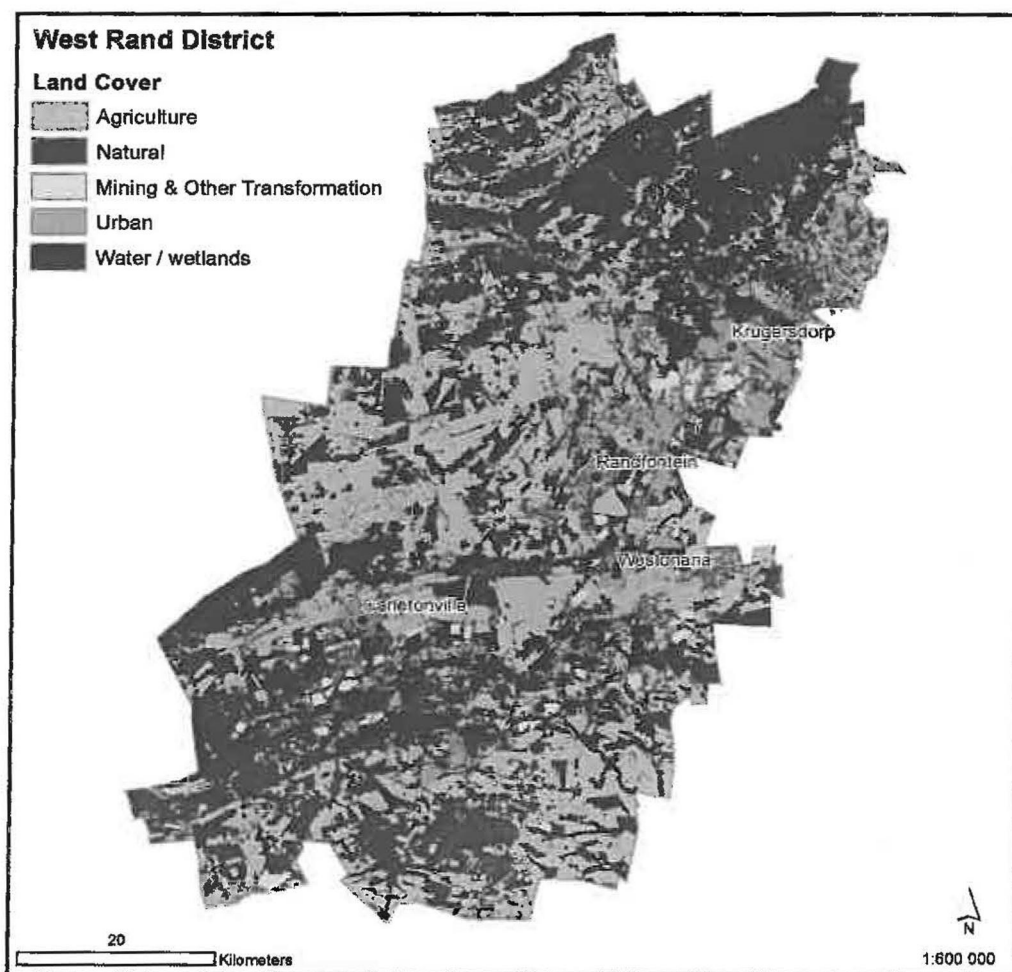


Figure 4. Land cover patterns in the West Rand District (GTI, 2009)

2.6 Ecosystem Protection Levels within the West Rand District

Protection level is the measurement of how well an ecosystem is represented in the existing protected area network. It is calculated as the proportion of the biodiversity target for each vegetation type that is included in the protected area network (Government of South Africa, 2010).

According to the National Biodiversity Assessment (Driver *et al.*, 2012), an ecosystem is considered "not protected" if under 5% of its biodiversity target is met within protected areas; "poorly protected" if 5-49% of its target is met in protected areas; and "moderately protected" if 50-99 % of its target is met. If more than 100% of target is met in protected areas it is considered "well protected". Two ecosystems in the West Rand District are not protected, five are poorly protected, three are moderately protected and one is well protected (Table 7, Figure 5).

Protection levels are important in the context of a bioregional plan as they give an indication of which ecosystem types are not sufficiently protected by formal protected areas with secure legal tenure. The long-term persistence of these ecosystem types is largely dependent on the land-use controls and other mechanisms influenced by a bioregional plan. Overall, this is the case throughout the Gauteng Province which is dominated by ecosystem types that are insufficiently protected by formal protected areas. Conversely, ecosystem types with high levels of formal protection which have large portions of their area included within formal protected areas are not likely to require the same level of attention within a bioregional plan. There may however be other reasons (e.g. ecological process areas or species of special concern) why portions of well protected ecosystem types may be included in Critical Biodiversity Areas or Ecological Support Areas identified in bioregional plans.

It is important to note that the protection levels of ecosystems used in this section are aligned with the NBA 2011 categories which consider only formal Protected Areas. These are areas such as National Parks, legally declared Nature Reserves, World Heritage Sites and Protected Environments which are secured by appropriate legal mechanisms such as declaration under the Protected Areas Act. Importantly, the Gauteng C-Plan v3.3, in contrast to the NBA 2011, uses a rather different definition of protected areas which include some undeclared conservation areas, and exclude some types such as Protected Environments and World Heritage Sites (see foot note in section 2.8.2).

Table 7. Ecosystem protection levels for the West Rand District, indicating the extent in hectares (ha) for each vegetation type.

Vegetation type	Extent in ha
Not protected	126522
Rand Highveld Grassland	64031
Soweto Highveld Grassland	62491
Poorly protected	256559
Carletonville Dolomite Grassland	149461
Eastern Temperate Freshwater Wetlands	1022
Egoli Granite Grassland	18377
Gauteng Shale Mountain Bushveld	56771
Moot Plains Bushveld	30929
Moderately protected	25232
Andesite Mountain Bushveld	10864
Gold Reef Mountain Bushveld	14368
Northern Afrotemperate Forest	>1
Well protected	429
Waterberg-Magaliesberg Summit Sourveld	429

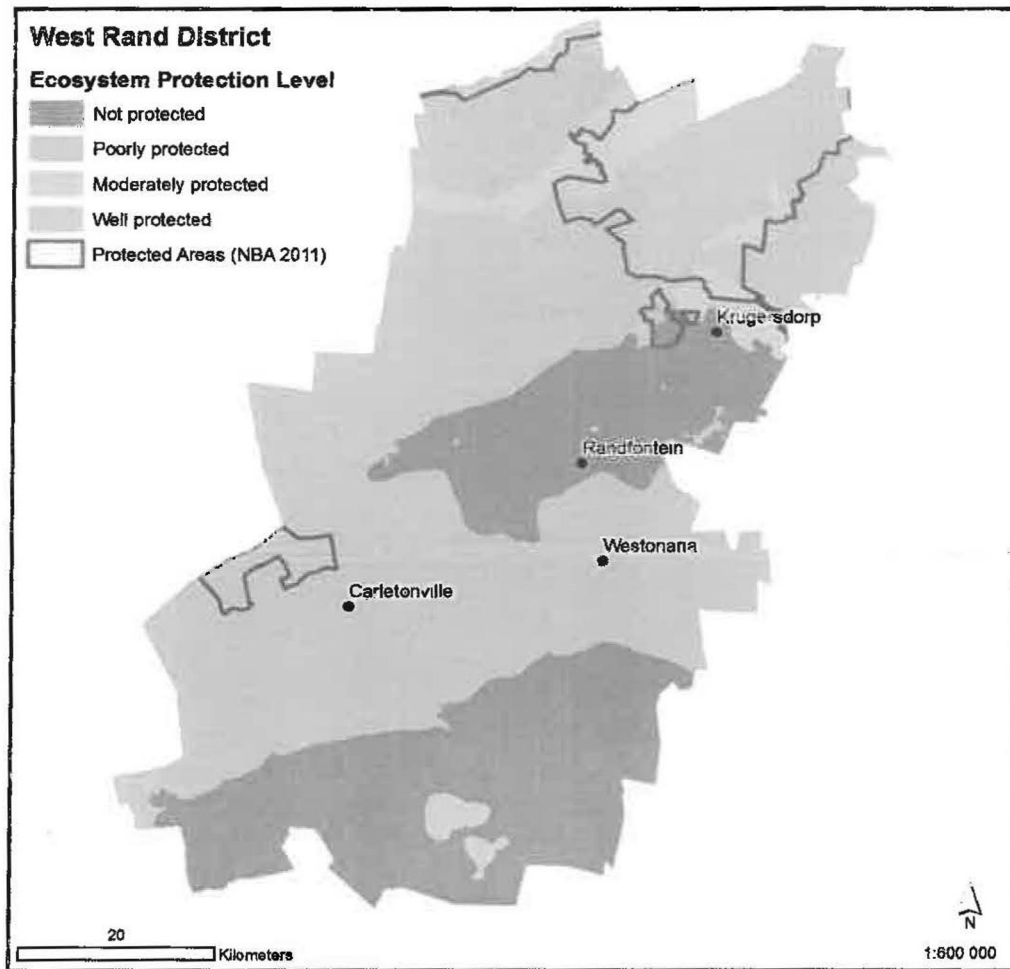


Figure 5. Ecosystem protection levels in the West Rand District.

2.7 Why is a Bioregional Plan Necessary?

A bioregional plan for the West Rand District is justified on the following grounds:

Biodiversity value: The region contains a relatively large number of ecosystems and species, as a consequence of its topographic and geological diversity. Further, the area supports important ecological processes, especially processes associated with wetland and river systems.

Threatened species and ecosystems: Much of the biodiversity in the district is threatened, with the area supporting a number of threatened species, particularly plants. 55% of the total area of the district has been identified as threatened according to the National List of Threatened Ecosystems, while 83% of the wetland ecosystem types and 33% of the river ecosystem types are threatened.

Nature of the pressures on biodiversity: The key pressures on biodiversity in the Gauteng Province are linked to rapid land-use change, particularly urban and industrial development. Thus a bioregional plan, which is primarily aimed at influencing decision-making processes related to land-use planning is the appropriate intervention tool.

Lack of viable alternative methods to protect biodiversity: Although protected area expansion through land purchase and biodiversity stewardship can play an important role in protecting specific sites, the combination of high levels of habitat loss, numerous development pressures, and high land values is likely to preclude protected area expansion from being the dominant conservation mechanism in the region. Most ecosystems remain poorly protected, and scope for protected area expansion is relatively limited. Hence the use of controls related to land-use planning (e.g. zoning schemes, SDFs, Metropolitan Open Space Systems), infrastructural development approvals (both strategically using Environmental Management Frameworks and reactively via the Environmental Impact Assessment process) and interventions such as implementing an appropriate Metropolitan Open Space System, all of which should be influenced by a bioregional plan, represent the best prospect for ensuring long-term persistence of biodiversity in the district.

2.8 Requirement for a systematic biodiversity plan

According to the Guideline for Bioregional Plans (DEAT, 2009) a bioregional plan must be a spatial plan showing terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning. A bioregional plan must be based on a systematic biodiversity plan, which is a rigorous, data-driven approach for assessing the location, status and importance of a range of biodiversity features. In addition to the general requirement for a systematic biodiversity plan, the guidelines specify a range of key characteristics that a biodiversity plan would need to have before it can be considered to be systematic, and further, details a range of specific issues that need to be addressed in the systematic biodiversity plan.

This Bioregional Plan for the West Rand District, is based on Gauteng C-Plan version v3.3, which is a systematic biodiversity plan undertaken by the GDARD. Details of the biodiversity planning process and methodologies that were used are described in the revised technical documentation provided with Gauteng C-Plan v3.3 (GDARD, 2013).

3 Part C: Critical Biodiversity Areas map, categories and description

3.1 Description of Critical Biodiversity Areas and Ecological Support Areas

Critical Biodiversity Areas within the bioregion are the portfolio of sites that are required to meet the region's biodiversity targets, and need to be maintained in the appropriate condition for their category. A map of CBAs for Gauteng was produced as part of the Gauteng C-Plan v3.3 process and sites were assigned to CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes (see Table 8).

In order to meet the requirements for publishing a bioregional plan, and to allow specific land-use guidelines to be developed, the broad provincial category of CBA has been split on the basis of land cover and the underlying biodiversity features into two sub-categories: Critical Biodiversity Area 1 are areas which need to remain in a largely natural state, and Critical Biodiversity Area 2, which are intensive agricultural areas (including cultivated fields) that have importance for supporting threatened species, should be maintained under their current agricultural land-use rather than in a natural state.

Ecological Support Areas are areas that are important for maintaining the ecological processes on which CBAs depend. Again, these were split into two categories based on their current ecological condition: Ecological Support Area 1 are largely natural or near-natural landscapes which should remain in at least a functional state which are important for preventing degradation of Critical Biodiversity Areas and Protected Areas, and are particularly focussed on the maintenance of ecological processes (e.g. river buffers helping to moderate water flow during floods); Ecological Support Area 2 are highly modified areas which nevertheless potentially retain some value for supporting ecological processes and where additional impacts on ecological processes should be avoided.

Other categories included in the CBA map² are Protected Areas³; Other Natural Areas, which are areas that still contain natural habitat but that are not required to meet biodiversity targets; and No Natural areas remaining, which are areas identified in Gauteng C-Plan v3.3 as having no remaining intact habitat.

² A CBA Map in this context refers to a map showing all the Critical Biodiversity Areas, Ecological Support Areas, Protected Areas, other natural areas, and no natural areas remaining.

³ The protected area definition used in Gauteng C-Plan v3.3 deviates from national policy documents and guidelines (Protected Areas Act, NBA 2011 & NPAES 2008) which include all formally proclaimed protected areas (including World Heritage Sites and Protected Environments) and exclude undeclared conservation areas which do not have secure legal status. Gauteng C-Plan v3.3 includes most types of formal Protected Area but excludes Protected Environments and World Heritage Sites (which are considered PAs under Protected Areas Act), and includes undeclared private nature reserves and natural heritage sites that have biodiversity focussed management plans in place (these would be categorised as informal conservation areas under the National Protected Area Expansion Strategy and would not be seen to be formally meeting Protected Area targets). **Note these differences are significant in the West Rand District.**

Table 8. Criteria used to define the CBA map categories.

CBA MAP CATEGORY	CRITERIA DEFINING THE CATEGORY
Protected Areas	Protected Areas include Provincial Nature Reserves (declared under the National Environment Management: Protected Areas Act 57 of 2003); Municipal Nature Reserves (including Bird Sanctuaries) which are declared under various local and provincial declarations and by-laws; other state owned protected areas (Meteorite Crater Reserve & natural portions of Botanical Gardens); and Private Nature Reserves and Natural Heritage Sites with management plans that have biodiversity conservation as the primary objective. The Protected Area definition used in Gauteng C-Plan v3.3, which this bioregional plan is obligated to follow, deviates from national policy documents and guidelines (Protected Areas Act, NBA 2011 & NPAES 2008) which include all formally proclaimed protected areas (including World Heritage Sites and Protected Environments) and exclude undeclared conservation areas which do not have secure legal status. Gauteng C-Plan v3.3 includes most types of formal Protected Area, but deviated from the norm by excluding Protected Environments and World Heritage Sites, while including undeclared private nature reserves and natural heritage sites that have biodiversity focussed management plans in place (these would be categorised as informal conservation areas under the National Protected Area Expansion Strategy and would not be seen to be meeting Protected Area targets). Protected Environments and World Heritage sites are indicated on the maps to improve alignment with national bioregional plan norms, but the Bioregional Plan does not have the mandate to alter the spatial product from Gauteng C-Plan v3.3.
Critical Biodiversity Areas 1	Any natural or near-natural terrestrial or aquatic area required to meet targets for biodiversity pattern and/or ecological processes. These include any area that is required for meeting biodiversity pattern targets such as remaining areas of Critically Endangered vegetation types and areas required to protect threatened species; any area that is required for meeting targets for ecological processes such as areas important for climate change adaptation; and hydrological process areas such as high priority wetlands and catchments, pan clusters and pans within priority catchments. In addition to the above areas where there is little or no choice of area identified, CBAs include all 'best design' sites in terms of meeting pattern and process targets, identified by the biodiversity planning process. 'Best design' refers to an identified network of natural or near-natural sites that meet pattern and process targets in a spatially efficient and ecologically robust way, and aim to avoid conflict with other activities (e.g. economic activity) where possible.
Critical Biodiversity Areas 2	Intensive agricultural landscapes which are required to meet biodiversity targets for threatened species or which support ecological processes on which these threatened species directly depend. Although the biodiversity planning process preferentially attempted to meet biodiversity targets in natural or near-natural landscapes, in some cases intensive agricultural landscapes may perform a key role in maintaining populations of threatened species (e.g. ploughed fields may be key foraging areas for threatened bird species such as Blue Cranes or Secretary Birds).
Ecological Support Area 1	Natural, near-natural or degraded areas required to be maintained in an ecologically functional state to support Critical Biodiversity Areas and/or Protected Areas. These include remaining floodplain, corridor, catchment, wetland and other ecological process areas that have not been identified as Critical Biodiversity Areas but which need to be maintained in a functional state to prevent degradation of CBAs and/or Protected Areas. ESA1s can include areas which would otherwise have been identified as CBAs except that have been degraded, but which are currently or potentially still important for supporting ecological processes. These areas are a focus for rehabilitation rather than the intensification of land

	uses.
Ecological Support Area 2	Areas with no natural habitat which retain potential importance for supporting ecological processes. These include urban and intensive agricultural landscapes on floodplains, in buffers around wetlands and in bottlenecks in key climate change corridors. Inappropriate management or intensification of land-use in these areas could result in additional impacts on ecological processes.
Other Natural Areas	Natural areas not included in the above categories.
No Natural Areas Remaining	These areas include intensive agriculture, plantations, mined areas, urban areas, infrastructure and dams.

According to the Gauteng C-Plan v3.3, 27.5% of the West Rand District is designated as Critical Biodiversity Areas. These CBAs have been split into CBA 1 and CBA 2 on the basis of their degree of habitat modification and the underlying biodiversity features which are being protected. The majority of the CBAs in the district are CBA 1 (27%) while CBA 2s make up 0.5% of the district. An additional 19% of the district is designated as Ecological Support Areas; this has also been split on the basis of habitat modification into ESA 1 (13%) and ESA 2 (6%). Other Natural Areas make up 12% of the district and just over 1% of the district is designated as Protected Area (Figure 6, Table 9). The high proportion of remaining natural habitat which has been designated as Critical Biodiversity Area 1 is a function of the relatively high levels of important biodiversity found within the district as well as the high levels of intensive agriculture and moderate urban development.

Table 9. The extent (in hectares) and percentage extent of Critical Biodiversity Areas and Ecological Support Areas identified by Gauteng C-Plan v3.3 in the West Rand District and in the whole Gauteng Province.

CBA Category	West Rand District (ha)	% Extent	Gauteng Province (ha)	% Extent
Protected Area	6887	2%	43948	2%
Critical Biodiversity Area 1	108698	27%	413684	23%
Critical Biodiversity Area 2	1885	0.5%	14311	1%
Ecological Support Area 1	51583	13%	178195	10%
Ecological Support Area 2	25078	6%	154330	8%
Other Natural Area	93283	23%	389346	21%
No Natural Area Remaining	121328	30%	624018	34%
Total	408742	100%	1817833	100%

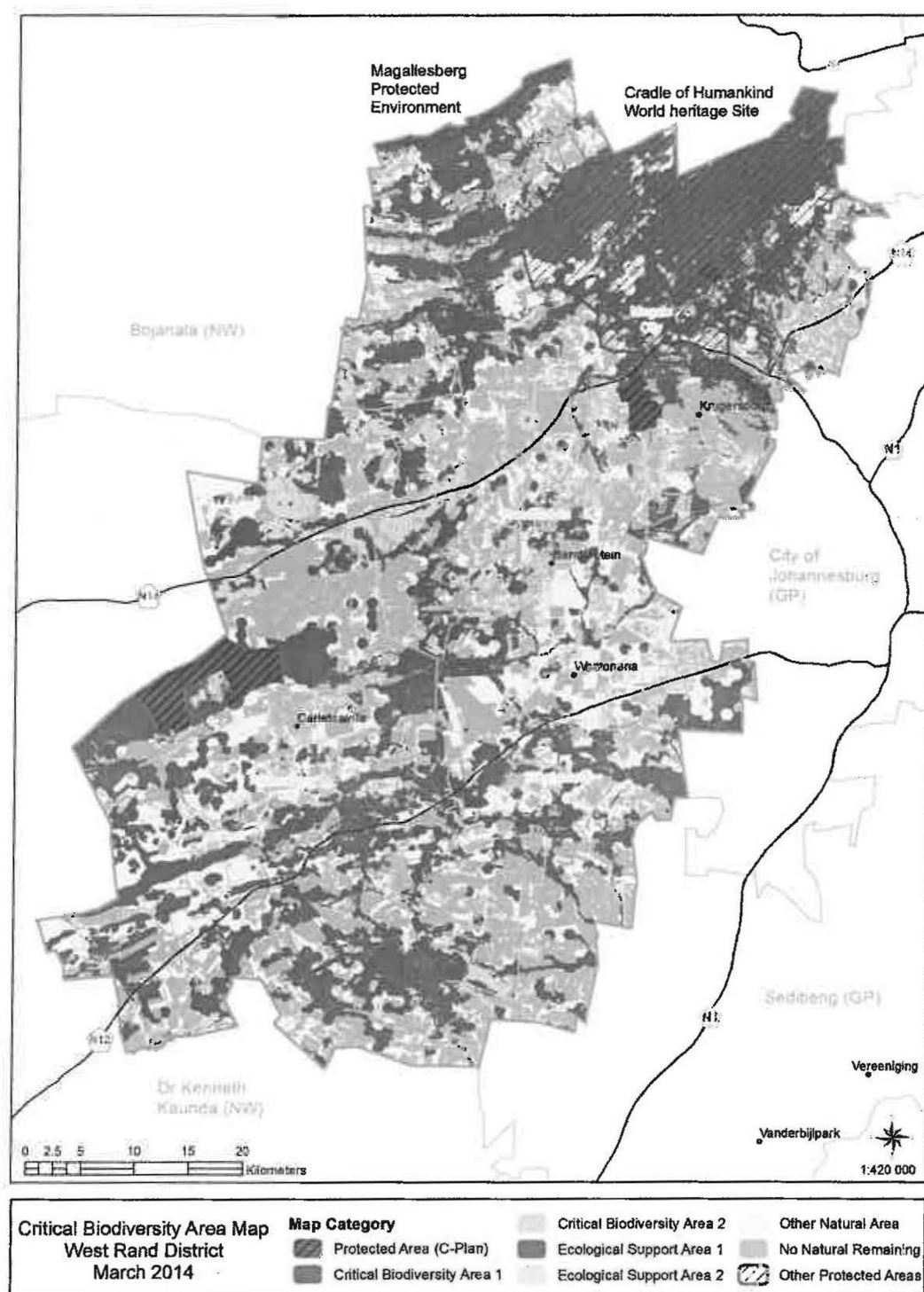


Figure 6. Critical Biodiversity Areas and Ecological Support Areas for the West Rand District. See Table 7 for category definitions.

4 Part D: Land-Use Guidelines

This section contains guidelines on land-uses that are compatible with the objectives of each category on the Critical Biodiversity Area map. Table 10 is the summary of biodiversity-compatible land-use guidelines, and includes a description of each category, the overall land management objectives for land within that category, recommendations on appropriate management and details of compatible and incompatible land-uses. The guidelines of compatible and incompatible land-uses are designed to assist planners to identify the appropriate zones and controls to impose on areas designated as Critical Biodiversity Areas or Ecological Support Areas when developing Spatial Development Frameworks, Environmental Management Frameworks or similar strategic land-use planning tools. The guidelines also give the evaluators of Environmental Impact Assessments an indication of appropriate land-use within each area. Importantly, the Bioregional Plan only provides guidance on appropriate land-uses and activities and does not grant or remove land development rights.

Table 11 contains broader land management guidelines for areas within each category on the Critical Biodiversity Area map. The table details management recommendations for each category on the Critical Biodiversity Areas map. The recommendations are designed to inform a wide range of land-use and planning decision-making processes and conservation implementation activities. The recommendations only provide guidance to decision-makers and serve as an informant to planning processes on appropriate land management and activities and do not in themselves grant or remove development rights.

Table 10. Biodiversity-compatible land-use guidelines for each category on the Critical Biodiversity Area map.

Category on the CBA Map	Description	Land Management Objective	Land Management Recommendations	Compatible Land-Use	Incompatible Land-Use
Protected Areas	Formal Protected Areas and Protected Areas pending declaration under Protected Areas Act. ⁴	Maintain natural land. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation.	Maintain or obtain formal conservation protection.	Conservation and associated activities.	All other land-uses.
Critical Biodiversity Areas (1)	Areas required to be maintained in a natural or near natural state to meet targets for biodiversity pattern (features) or ecological processes.	Maintain natural land and ecological processes. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation.	Obtain formal conservation protection where possible. Implement appropriate zoning to avoid net loss of intact habitat or intensification of land-use.	Conservation and associated activities. Extensive game farming (i.e. over large areas, at carefully managed intensities) and eco-tourism operations with strict control on environmental impacts and carrying capacities, where overall biodiversity-compatible land-use is secured across a property. Extensive Livestock Production on natural rangeland with strict control on environmental impacts and carrying capacities. Urban Open Space Systems	Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, pipelines and power lines ⁵), Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures). Agriculture (dry land & irrigated cropping) and Plantation Forestry. Small holdings
Critical Biodiversity Area (2)	Cultivated landscapes which retain importance for supporting threatened species			Maintain current agricultural activities. Ensure that land-use is not intensified and that activities are managed to minimize impact on threatened species.	Avoid conversion of agricultural land to more intensive land-uses which may have a negative impact on threatened species or ecological processes.

⁴ Note that in terms of accepted national practice, this category should be limited to formal Protected Areas legally secured under the Protected Areas Act or equivalent legislation, and, further, should include all of these areas. However, Gauteng C-Plan v3.3 anomalously did not include all types of formal Protected Areas (with World Heritage Sites and Protected Environments being excluded) while some informal conservation areas (e.g. undeclared private nature reserves and certain other categories of state land where there is some conservation management) were included in this category. Refer to Table 8 for a full explanation of the discrepancies.

⁵ For grasslands, power lines can be a compatible land-use if they are appropriately planned, they keep out of wetlands and areas where threatened birds breed/feed, and where the power lines do not lead to ecosystem fragmentation.

Category on the CBA Map	Description	Land Management Objective	Land Management Recommendations	Compatible Land-Use	Incompatible Land-Use
Ecological Support Areas (1)	Natural, near-natural and degraded areas required to be maintained in an ecologically functional state to support Critical Biodiversity Areas.	Maintain ecological processes.	Implement appropriate zoning and land management guidelines to avoid impacting on ecological processes such as key landscape corridors and linkages and avoiding areas important for hydrological processes (e.g. floodplains). Avoid intensification of land-use.	Conservation and associated activities. Extensive game farming and eco-tourism operations. Extensive Livestock Production. Urban Open Space Systems. Low density rural residential, smallholdings or resorts where development design and overall development densities allow maintenance of ecological functioning.	Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, pipelines), excluding power lines which are compatible with Ecological Support Areas so long as they are designed to avoid impacting on processes such as water flow. Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures) Agriculture (dry land & irrigated cropping) and Plantation Forestry. Small holdings Note: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to maintain overall ecological functioning of ESAs.
Ecological Support Areas (2)	Areas with no natural habitat which retain potential importance for supporting ecological processes.	Avoid additional impacts on ecological processes.	Avoid intensification of land-use, which may result in additional impact on ecological processes.	Existing activities (e.g. arable agriculture) should be maintained, but where possible a transition to less intensive land-uses should be favoured.	Any land-use or activity which results in additional impacts on ecological functioning, mostly associated with the intensification of land-use in these areas (e.g. Change of floodplain from cultivation to an urban land-use or from recreational fields and parks to urban).
Other Natural Areas	Natural and intact but not required to meet targets, or identified as Critical Biodiversity Areas or Ecological Support Areas.	No management objectives, land management recommendations or land-use guidelines are provided as these areas are outside the ambit of the Bioregional Plan. These areas are nevertheless subject to all applicable town and regional planning guidelines and policy. Where possible, existing severely modified areas should be favoured for infrastructure development before "Other natural areas" may later be required either due to the identification of previously unknown important biodiversity features on these sites, or alternatively where the loss of "Critical Biodiversity Areas" has resulted in the need to identify alternative sites.			
No natural habitat remaining	Irreversibly modified or degraded areas which are not required as Ecological Support Areas, including intensive agriculture, urban development, industry, and infrastructure.				

Table 11. Recommended land management guidelines in Critical Biodiversity Areas and Ecological Support Areas.

CRITICAL BIODIVERSITY AREAS ONE	
Keep in a NATURAL STATE	
General Recommendations	
<ul style="list-style-type: none"> No further loss of natural habitat should occur i.e. all land in this category should be maintained as natural vegetation cover; These areas of land can act as possible biodiversity offset receiving areas; Prioritise CBAs for land care projects, Working for Water (WfW) and NGOs to direct their conservation projects, programmes and activities; An Ecological Management Plan should be compiled where required for CBAs. EMP to include invasive alien plant control, fire management etc; Control of illegal activities (such as hunting and dumping) which impact biodiversity should be prioritized in CBA areas. 	
Protection	
<ul style="list-style-type: none"> CBAs not formally protected should be rezoned to conservation or appropriate open space zoning, and where possible declared in terms of NEM: Protected Areas Act. The Biodiversity Stewardship program should prioritise privately-owned erven in CBAs to be incorporated into the protected area network through Conservation Agreements and incentives (e.g. rates rebates); Maintain and legally protect the Open Space System that maintains CBAs. 	
Rehabilitation	
<ul style="list-style-type: none"> Degraded or disturbed CBAs should be prioritized for rehabilitation through programmes such as Working for Water, Working for Wetlands. 	
Development Guidelines	
Where infrastructure is proposed, the following guidelines should be implemented -	
<ul style="list-style-type: none"> Rezoning of properties to afford additional land-use rights that will result in increased biodiversity loss should not be granted; Permission to increase the permitted number of units per erf or per ha should not be granted; Infrastructure developments should be limited to existing developed / degraded footprints, if present; Units carefully dispersed or clumped to achieve least impact, particularly with regard to habitat loss and fragmentation; The installation of infrastructure in CBAs is not desirable and should only be considered if all alternative alignment and design options have been assessed and found to be non-viable. Under such conditions, at least a Basic Assessment (BA) should be undertaken, and if approved, a comprehensive EMP must be developed and best-practice restoration efforts strictly implemented; Ecological Specialist to conduct the ecological assessment; A Construction & Operational Environmental Management Plan should be compiled and implemented. 	
Where development proposals other than the preferred biodiversity-compatible land-uses (see table above) are submitted in terms of the NEMA: EIA regulations or Land-Use Planning Ordinance	

(LUPO):

- A Screening Exercise should be undertaken by a Biodiversity Specialist or Ecologist to verify the CBA map category on site;
- If the site is verified as a CBA, land-uses other than Conservation Use should be identified as a 'Fatal Flaw';
- If the application is pursued they should be informed by a specialist biodiversity assessment.

Aquatic Ecosystems

- Maintain water quality and flow regimes should be maintained as close to natural as possible;
- Where Environmental Reserves or Environmental Flow Requirements have been determined these should be strictly adhered to;
- All effluent (including municipal, mining and industrial waste water) as well as acid mine drainage should be treated to required specifications before release;
- Stormwater flow should be managed to avoid damage to CBA areas.
- Where CBAs include floodplains (e.g. areas within the 1:100 year floodline), riparian areas (e.g. as a minimum, the 32m around rivers) or buffers around wetlands, particular attention should be applied to ensure that these remain in a natural state or are rehabilitated to this state. In addition to avoiding habitat loss or degradation, other activities such as livestock access may need to be controlled and invasive alien vegetation managed to avoid damage to banks. Do not permit infilling, excavation, drainage, hardened surfaces (including buildings and asphalt), intensive agriculture or any new infrastructure developments within a river or wetland.
- Areas that are degraded or disturbed should be rehabilitated, through programmes such as Working for Water, Working for Wetlands and a systematic invasive alien vegetation eradication programme implemented.

CRITICAL BIODIVERSITY AREA TWOMaintain as an **AGRICULTURAL LANDSCAPE****General Recommendations**

- Avoid conversion of agricultural land to more intensive land-uses which may have a negative impact on threatened species or the ecological processes which support these species.
- Agricultural activities should be managed to avoid impacts on the specific threatened species dependent on these areas.
- Intensification of land-use in these areas should be avoided.
- Should there be any remaining areas intact habitat in this category, these areas should be treated as Critical Biodiversity Area One, and no further loss of natural habitat should occur;
- These areas of land would be the focus of threatened species specific management interventions by conservation agencies and NGOs;
- Species management plans may be necessary in these areas.
- Control of illegal activities (such as hunting and dumping) which impact on threatened species should be prioritized in CBA2 areas.

Protection

- CBA2s may be the focus of stewardship agreements aimed at the protection of threatened

species.

- CBA2s should be appropriately zoned to avoid conversion from agriculture.

Rehabilitation

- Rehabilitation work should only be undertaken if it does not negatively impact on the identified threatened species dependent on the agricultural landscape.

Development Guidelines

Where infrastructure is proposed, the following guidelines should be implemented -

- Rezoning of properties to afford additional land-use rights that will result in increased biodiversity loss through conversion of land from agriculture should not be granted;
- Permission to increase the permitted number of units per erf or per ha should not be granted;
- Infrastructure developments should be limited to existing footprints, if present, and should avoid encroaching on natural or agricultural landscapes;
- Should additional infrastructure be required, the requirements of threatened species should be taken into account. At least a Basic Assessment (BA) should be undertaken for any development which results in the intensification of land-use, and if intensification of land-use is approved, a comprehensive EMP or must be developed to minimize impacts on threatened species;
- Ecological Specialist to conduct the ecological assessment;
- A Construction & Operational Environmental Management Plan should be compiled and implemented.

Where development proposals other than the preferred biodiversity-compatible land-uses (see table above) are submitted in terms of the NEMA: EIA regulations or Land-Use Planning Ordinance (LUPO):

- A Screening Exercise should be undertaken by a Biodiversity Specialist or Ecologist to verify the CBA map category on site;
- If the site is verified as a CBA2, developments which result in the intensification of land-use or the conversion of agricultural land should be identified as a 'Fatal Flaw';
- If the application is pursued they should be informed by a specialist biodiversity assessment.

Aquatic Ecosystems

- Maintain water quality and flow regimes should be maintained as close to natural as possible;
- Where Environmental Reserves or Environmental Flow Requirements have been determined these should be strictly adhered to;
- All effluent (including municipal, mining and industrial waste water) as well as acid mine drainage should be treated to required specifications before release;
- Stormwater flow should be managed to avoid damage to CBA2 areas.
- Where CBA2s include floodplains (e.g. areas within the 1:100 year floodline), riparian areas (e.g. as a minimum, the 32m around rivers) or buffers around wetlands, particular attention should be applied to ensure that these remain in a natural state or are rehabilitated to this state in order to maintain suitability for threatened species dependent on these habitats. In addition to avoiding intensification of land-use, other activities such as livestock access to wetlands may need to be controlled to avoid impacts on threatened species. Do not permit infilling, excavation, drainage, hardened surfaces (including buildings and asphalt), intensive agriculture or any new infrastructure developments within a river or wetland.

- Areas that are degraded or disturbed should be rehabilitated, through programmes such as Working for Water, Working for Wetlands and a systematic invasive alien vegetation eradication programme implemented. Rehabilitation work should be undertaken in a way which does not negatively impact on the survival of threatened species.

ECOLOGICAL SUPPORT AREAS ONE

Maintain in a FUNCTIONAL STATE

General Recommendations

- Maintain in a functional state, avoid intensification of land-uses, and rehabilitate to a natural or semi-natural state where possible. In transformed areas which are important for maintaining ecological processes, current land-uses should be maintained, intensification of use (e.g. a transition from agriculture to urban) should be avoided, and where possible areas should be rehabilitated.
- No further loss of natural habitat should be allowed, and land in this category currently in a degraded state should be rehabilitated or restored to a natural or semi-natural state once the current land-use has ceased;
- Maintain current land-uses where these play a role in supporting ecological processes;
- Ensure land-use changes do not impact negatively on ecological processes.
- The maintenance of connectivity between CBAs, continued ecosystem functioning within the CBA corridors, and the prevention of degradation of adjacent Critical Biodiversity Areas must be achieved;
- After the CBAs, ESAs should be prioritised for land care projects, Working for Water (WfW) and NGOs to direct their conservation projects, programmes and activities;
- An Ecological Management Plan should be compiled where required for ESAs. EMP to include invasive alien plant control, fire management etc.

Development Guidelines

Where infrastructure is proposed, the following guidelines should be implemented -

- Rezoning of properties to afford additional land-use rights that will result in increased impact on ecological processes should not be granted, unless significant net conservation gains can be achieved, ecosystem functioning and connectivity of Ecosystem Support Areas (ESAs) will not be compromised, and biodiversity impacts with regard to species and ecosystems are of an acceptable level and mitigated where possible;
- Infrastructure developments should be limited to existing developed / degraded footprints, where possible;
- Units carefully dispersed or clumped to achieve least impact, particularly with regard to impacts on ecological processes;
- Ecological Specialist to conduct the ecological assessment;
- A Construction & Operational Environmental Management Plan to be compiled and implemented.

Where development proposals other than the preferred biodiversity-compatible land-uses are submitted in terms of the NEMA: EIA regulations or Land-use Planning Ordinance (LUPO) for areas

which remain intact:

- A Screening Exercise should be undertaken by a Biodiversity Specialist or Ecologist to verify the CBA map category on site;
- If the site is verified as a ESA, developments other than the preferred biodiversity-compatible land-uses should be carefully screened to ensure that developments are planned and activities undertaken in a way that minimizes impact on ecological processes. Impacts should be mitigated.
- If the application is pursued they should be informed by a specialist biodiversity assessment.

In transformed areas which are still important for supporting ecological processes, the following guidelines should be implemented -

- Current land-uses should be maintained, intensification of use (e.g. a transition from extensive agriculture to urban) should be avoided, and where possible areas should be rehabilitated;
- Land-use changes should be screened to ensure that they do not have an unacceptable impact on ecological processes.

Aquatic Ecosystems

- Water quality and flow regimes should be maintained as close to natural as possible;
- Where Environmental Reserves or Environmental Flow Requirements have been determined these should be strictly adhered to;
- All effluent (including municipal, mining and industrial waste water) as well as acid mine drainage should be treated to required specifications before release;
- Stormwater flow should be managed to avoid damage to ESA areas;
- Where ESAs include floodplains (e.g. areas within the 1:100 year floodline), riparian areas (e.g. as a minimum, the 32m around rivers) or buffers around wetlands, particular attention should be applied to ensure that these remain in a natural state or are rehabilitated to this state. In addition to avoiding habitat loss or degradation, other activities such as livestock access may need to be controlled and invasive alien vegetation managed to avoid damage to banks. Do not permit infilling, excavation, drainage, hardened surfaces (including buildings), intensive agriculture or any new infrastructure developments within a river or wetland.
- Areas that are degraded or disturbed should be rehabilitated, through programmes such as Working for Water, Working for Wetlands and a systematic invasive alien vegetation eradication programme implemented.
- Creation of berms, roads, culverts, canalisation, channelisation, invasive alien vegetation, impoundment, abstraction, well points, storm-water or other point source inflows, irrigation return flows, grazing / trampling, agriculture, golf courses, suburban gardens, artificial deepening, and drainage, should be avoided where possible within the 1:20 year floodline.

ECOLOGICAL SUPPORT AREAS TWO

Maintain and restore ECOLOGICAL FUNCTIONING where possible

General Recommendations

- Additional impacts on ecological processes should be avoided. In transformed areas which are important for maintaining ecological processes, current land-uses should be maintained, intensification of use (e.g. a transition from agriculture to urban) should be avoided, and

where possible areas should be rehabilitated.

- The maintenance of connectivity between CBAs, continued ecosystem functioning within the CBA corridors, and the prevention of degradation of adjacent Critical Biodiversity Areas must be achieved;
- In some cases the rehabilitation of ESA2s may be the suitable for land care projects, Working for Water (WfW) and NGOs to direct their conservation projects, programmes and activities;

Development Guidelines

Where infrastructure is proposed, the following guidelines should be implemented -

- Infrastructure should be designed to avoid additional impacts on ecological processes.

In transformed areas which are still important for supporting ecological processes, the following guidelines should be implemented -

- Current land-uses should be maintained, intensification of use (e.g. a transition from agriculture to urban) should be avoided, and where possible areas should be rehabilitated;
- Infrastructural developments should be screened to ensure that they do not have an unacceptable impact on ecological processes.

Aquatic Ecosystems

- Water quality and flow regimes should be maintained as close to natural as possible;
- Where Environmental Reserves or Environmental Flow Requirements have been determined these should be strictly adhered to;
- All effluent (including municipal, mining and industrial waste water) as well as acid mine drainage should be treated to required specifications before release;
- Stormwater flow should be managed to avoid damage to ESA2 areas;
- Where ESA2s include floodplains (e.g. areas within the 1:100 year floodline), riparian areas (e.g. as a minimum, the 32m around rivers) or buffers around wetlands, particular attention should be applied to ensure that there is no additional impact on ecological functioning, and where possible these areas rehabilitated to improve ecological functioning. In addition to avoiding intensification of land-use, other activities such as livestock access may need to be controlled and invasive alien vegetation managed to avoid damage to banks. Do not permit infilling, excavation, drainage, hardened surfaces (including buildings), intensive agriculture or any new infrastructural developments within a river or wetland.
- Creation of berms, roads, culverts, canalisation, channelisation, invasive alien vegetation, impoundment, abstraction, well points, storm-water or other point source inflows, irrigation return flows, grazing / trampling, agriculture, golf courses, suburban gardens, artificial deepening, and drainage, should be avoided where possible within the 1:20 year floodline.

5 Part F: Monitoring, Reviewing and Updating

The West Rand District Municipality is the developer and primary implementing agent of this Bioregional Plan, and is therefore responsible for the monitoring, reviewing and updating of this plan. The systematic biodiversity plan underpinning the Bioregional Plan is the responsibility of the Gauteng Department of Agriculture and Rural Development (GDARD).

As the Bioregional Plan was developed in parallel to similar bioregional plans in the Gauteng Province, it is dependent on the same underlying systematic biodiversity plan, and as there are numerous issues requiring joint planning (e.g. shared catchments), it would be efficient to establish an inter-agency structure for coordinating the implementation, monitoring, reviewing and updating of the bioregional plans. Alternatively, these activities would need to be undertaken independently by the West Rand District.

- The establishment of an appropriate inter-agency structure to coordinate the implementation, monitoring, reviewing and updating of the bioregional plan.
- The ongoing evaluation of its use in land-use planning and decision-making.
- The review of, and if necessary revision of the underlying systematic biodiversity plan at least every five years.
- The update of the published bioregional plan at least every five years.

5.1 Monitoring

To ensure compliance with the Biodiversity Act and the Guideline for Bioregional Plans, formal monitoring of the implementation of the Bioregional Plan must be undertaken on at least a five-yearly cycle to ensure appropriate revision of the bioregional plan. However, as the successful implementation of the bioregional plan is dependent on a range of measures, and requires the cooperation of a number of different departments and agencies, it is recommended that a bi-annual or annual monitoring and reporting program is established immediately on the gazetting of the Bioregional Plan. It is recommended that a Gauteng Bioregional Plan Coordination Committee (or an equivalent structure) is convened with representation by West Rand District and other municipalities with bioregional plans in Gauteng, and the Gauteng Department of Agriculture and Rural Development (GDARD). The task of the committee would be to ensure the effective implementation of the bioregional plans, to undertake the ongoing monitoring of the implementation of the plans, and to ensure the review and update the bioregional plans when necessary. Gathering of data on the monitoring indicators should become a normal function of the planning departments within each of the municipalities. The outcomes of the monitoring programmes should be used as key indicators for the biodiversity and planning departments within the West Rand District and other municipalities with bioregional plans in Gauteng and the Gauteng Department of Agriculture and Rural Development (GDARD).

5.1.1 Monitoring indicators

The primary purpose of the ongoing monitoring is to evaluate the ongoing implementation of the Bioregional Plan, rather than to evaluate the biodiversity outcomes of these actions or to describe the state of biodiversity within the Bioregion. Therefore, the following **implementation monitoring** indicators are proposed:

- Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that are contained within conservation orientated zones with Spatial Development Frameworks and Environmental Management Frameworks. For this purpose, conservation

orientated zones are defined as areas where the primary purpose is conservation or where there are significant restrictions on allowable land-uses.

- Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that are under some form of conservation management (including both formal protection and conservation stewardship agreements).
- Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas where subdivision has been approved or where increased development rights have been granted.
- Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas where appropriate biodiversity management interventions have been applied (e.g. clearing of invasive alien species).
- The advantage of these indicators is that they do not require investment into baseline biodiversity data gathering, but rather focus on the evaluation of the implementation mechanism. This should allow these indicators to be evaluated on at least an annual basis. However, it will be necessary to evaluate the biodiversity outcome of the implementation of the bioregional plan in order to conduct the required five-year review of the Bioregional Plan. Additional **biodiversity monitoring** indicators should include at least an evaluation of:
 - Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that have been severely modified due to various land-use changes.
 - Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that are in a natural or near-natural state (key aspects would be level of invasive alien vegetation infestation, level of degradation due to overgrazing or dumping etc).
 - Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that have been rehabilitated to a satisfactory ecological condition.

5.2 Review

The Bioregional Plan must be reviewed and updated (where necessary) at least every five years. It is recommended that this is a function of the proposed bioregional plan Coordination Committee (or an equivalent structure) which should include representation of the West Rand District and the other municipalities with bioregional plans in Gauteng, the Gauteng Department of Agriculture and Rural Development (GDARD). The review process should examine:

- Progress towards the full implementation of the bioregional plan (as measured by the implementation monitoring indicators from Section 5.1.1).
- The biodiversity outcome of the implementation actions (as measured by the biodiversity monitoring indicators from Section 5.1.1).
- The need (or lack thereof) for an update of the underlying systematic biodiversity plan. Although the update of a systematic biodiversity plan is a data intensive and time consuming process, it is likely that it will be necessary to update underlying systematic biodiversity plan for the province at least every five years.
- The need (or lack thereof) for an update of the other components of the bioregional plan (e.g. land-use guidelines; monitoring indicators and processes).

5.3 Updating

Should the bioregional plan review process (5.2) indicate that it is necessary to update the Bioregional Plan or components of the plan, then this should be undertaken, and the revised plan should be resubmitted to the MEC for approval. Ideally this should be timed to precede the revision cycle for municipal SDFs. Responsibility for the update lies with the West Rand District which is the developer and primary implementing agent of the bioregional plan. Importantly,

the underlying systematic biodiversity plan remains the responsibility of the Gauteng Department of Agriculture and Rural Development (GDARD).

6 Part G: GIS Files

Table 12. Geographic Information System (GIS) Data files

File name	Important fields	Description	Source
Gauteng_CBA_August_2011.shp	CBA_FIN= Critical Biodiversity Area Category; CBA1, CBA2, ESA1, ESA2, ONA, NNR	Critical Biodiversity Areas and Ecological Support Areas based on Gauteng C-Plan v3.3, modified for this Bioregion Plan: CBA cat. classes of interest [CBAFIN= CBA1, CBA2, ESA1, ESA2, NNR, ONA, PA]	GDARD 2013
G_CBA_0811 (GRID)	CBA_FIN, CPLAN33, LOOKUP33, LC5, DM	Integrated GRID data set (10m) with final CBA category (CBAFIN), LandCover (LC5), District (DM), CPLAN AREA (CPLAN33), Description of CBA (LOOKUP33).	GDARD 2013

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8 Glossary

Biodiversity: The diversity of genes, species and ecosystems on Earth, and the ecological and evolutionary processes that maintain this diversity.

Biodiversity stewardship: a model for expanding the protected area network in which conservation authorities enter into contract agreements with private and communal landowners to place land that is of high biodiversity value under formal protection. Different categories of agreement confer varying degrees of protection on the land and hold different benefits for landowners. The landowner retains title to the land, and the primary responsibility for management remains with the landowner, with technical advice and assistance provided by the conservation authority.

Biodiversity target: The minimum proportion of each ecosystem type that needs to be kept in a natural or near-natural state in the long term in order to maintain viable representative samples of all ecosystem types and the majority of species associated with those ecosystem types.

Biome: An ecological unit of wide extent, characterised by complexes of plant communities and associated animal communities and ecosystems, and determined mainly by climatic factors and soil types. A biome may extend over large, more or less continuous expanses of land surface, or may exist in small discontinuous patches.

Bioregional plan (published in terms of the Biodiversity Act): A map of Critical Biodiversity Areas and Ecological Support Areas, for a municipality or group of municipalities, accompanied by contextual information, land- and resource-use guidelines and supporting GIS data. The map must be produced using the principles and methods of systematic biodiversity planning, in accordance with the Guideline for Bioregional Plans.⁶ A bioregional plan represents the biodiversity sector's input into planning and decision-making in a range of other sectors. The development of the plan is usually led by the relevant provincial conservation authority or provincial environmental affairs department. A bioregional plan that has not yet been published in the Government Gazette in terms of the Biodiversity Act is referred to as a biodiversity sector plan.

Conservation area: 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. Because there is no long-term security associated with conservation areas, they are not considered a strong form of protection. Also see Protected area.

Critical Biodiversity Area: Areas required to meet biodiversity targets for ecosystems, species or ecological processes, as identified in a systematic biodiversity plan. May be terrestrial or aquatic.

Critically endangered ecosystem: an ecosystem type that has very little of its original extent (measured as area, length or volume) left in natural or near-natural condition. Most of the ecosystem type has been severely or moderately modified from its natural state. The ecosystem

⁶ Department of Environmental Affairs and Tourism. 2009. *Guideline regarding the determination of bioregions and the preparation and publication of bioregional plans*. Notice No. 291, Government Gazette No. 32006, 16 March 2009.

type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost.

Ecological Support Area: An area that is not essential for meeting biodiversity targets but plays an important role in supporting the ecological functioning of one or more Critical Biodiversity Areas or in delivering ecosystem services. May be terrestrial or aquatic.

Ecosystem protection level: Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as well protected, moderately protected, poorly protected, or not protected, based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Unprotected, poorly protected or moderately protected ecosystem types are collectively referred to as under-protected ecosystems.

Ecosystem services: the benefits that people obtain from ecosystems, including provisioning services (such as food and water), regulating services (such as flood control), cultural services (such as recreational benefits), and supporting services (such as nutrient cycling, carbon storage) that maintain the conditions for life on Earth. Ecosystem services are the flows of value to human society that result from a healthy stock of ecological infrastructure. If ecological infrastructure is degraded or lost, the flow of ecosystem services will diminish.

Ecosystem threat status: Indicator of how threatened ecosystems are, in other words the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function or composition. Ecosystem types are categorised as critically endangered, endangered, vulnerable or least threatened, based on the proportion of the original extent of each ecosystem type that remains in good ecological condition relative to a series of biodiversity thresholds. Critically endangered, endangered and vulnerable ecosystems are collectively referred to as threatened ecosystems, and may be listed as such in terms of the Biodiversity Act.

Ecosystem type: An ecosystem unit that has been identified and delineated as part of a hierarchical classification system, based on biotic and/or abiotic factors. Factors used to map and classify ecosystems differ in different environments. Ecosystem types can be defined as, for example, vegetation types, river ecosystem types, wetland ecosystem types, estuary ecosystem types, or marine or coastal habitat types. Ecosystems of the same type are likely to share broadly similar ecological characteristics and functioning. Also see National ecosystem classification system.

Endangered ecosystem: An ecosystem type that is close to becoming critically endangered.

Freshwater Ecosystem Priority Area: A river or wetland that is required to meet biodiversity targets for freshwater ecosystems.

Least threatened ecosystem: An ecosystem type that has experienced little or no loss of natural habitat or deterioration in condition

Protected area: An area of land or sea that is formally protected by law and managed mainly for biodiversity conservation. This is a narrower definition than the IUCN definition, which includes

areas that are not legally protected and that would be defined in South Africa as conservation areas rather than protected areas. Also see Conservation area.

Species of special concern: Species that have particular ecological, economic or cultural significance, including but not limited to threatened species

Systematic biodiversity planning: A scientific method for identifying geographic areas of biodiversity importance. It involves: mapping biodiversity features (such as ecosystems, species, spatial components of ecological processes); mapping a range of information related to these biodiversity features and their ecological condition; setting quantitative targets for biodiversity features; analysing the information using software linked to GIS; and developing maps that show spatial biodiversity priorities. The configuration of priority areas is designed to be spatially efficient (i.e. to meet biodiversity targets in the smallest area possible) and to avoid conflict with other land and water resource uses where possible.

Threatened ecosystem: An ecosystem 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 structure, function or composition. The Biodiversity Act allows the Minister of Environmental Affairs or a provincial MEC for Environmental Affairs to publish a list of threatened ecosystems. To date, threatened ecosystems have been listed only in the terrestrial environment. In cases where no list has yet been published by the Minister, such as for all aquatic ecosystems, the ecosystem threat status assessment in the NBA can be used as an interim list in planning and decision-making. Also see Ecosystem threat status.

Threatened species: A species that has been classified as Critically Endangered, Endangered or Vulnerable, based on a conservation assessment (Red List), using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.

Vulnerable ecosystem: An ecosystem type that still has the majority of its original extent (measured as area, length or volume) left in natural or near-natural condition, but has experienced some loss of habitat or deterioration in condition. The ecosystem type is likely to have lost some of its structure and functioning, and will be further compromised if it continues to lose natural habitat or deteriorate in condition.

Bioregional Plan for the Ekurhuleni Metropolitan Municipality



Compiled by
Ekurhuleni Metropolitan Municipality
November 2011, revised March 2014

Executive Summary

This Bioregional Plan covers the Ekurhuleni Metropolitan Municipality. The Ekurhuleni Metro is the developer and primary implementing agent of the Bioregional Plan. The spatial component of the Bioregional Plan is based on the systematic biodiversity planning that was undertaken by the Gauteng Department of Agriculture and Rural Development (GDARD).

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. This is done by providing a map of biodiversity priority areas, including Critical Biodiversity Areas and Ecological Support Areas, with accompanying land-use planning and decision-making guidelines.

The Ekurhuleni Metropolitan Municipality falls within the Grassland biome, and is home to a disproportionately high percentage of rare and threatened species and threatened ecosystems. A high proportion of South Africa's mining activity, heavy industry, commercial enterprise and urban population occur in the region, and consequently, the pressures placed on the environment and the remaining natural ecosystems are very high, and opportunities for conservation of biodiversity are limited. These factors together make a bioregional plan an appropriate tool for addressing the pressures on biodiversity in the Metro.

There are at least 16 threatened plant species and 14 threatened animal species in the Ekurhuleni Metro, and ten nationally listed threatened ecosystems. Aquatic ecosystems are equally unique in the bioregion, with 97% of wetland types and 29% of river types in the Metro listed as threatened. Just over a third of the Ekurhuleni Metro is in a natural or near-natural state (36%), with urban areas (35%), intensive agriculture (23%) and mining (7%) together covering 64% of the Metro. Critical Biodiversity Areas cover 18% of the Metro; with CBA 1 (natural or near-natural state) covering 17% and CBA 2 (highly modified landscapes which retain importance for threatened species) covering 1%. Ecological Support Areas cover a further 18% of the Metro; with ESA 1 (natural, near-natural or degraded state) covering 6% and ESA 2 (highly modified landscapes which retain importance for ecological processes) covering 12%. Protected areas cover just over 1% of the Ekurhuleni Metro.

This Bioregional Plan is based on Critical Biodiversity Areas identified and described in Gauteng C-Plan v3.3, a systematic biodiversity plan developed by GDARD. The plan is aligned with other relevant spatial plans for the Metro. The Bioregional Plan is consistent with the National Environmental Management: Biodiversity Act, and meets all the requirements of the Guideline Regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans. There is a wide range of mandatory and recommended users of bioregional plans, including local, provincial and national government departments and authorities whose decisions and actions impact on biodiversity and the natural environment; national and provincial conservation agencies; environmental and planning consultants; conservation NGOs; and private landowners.

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List of Abbreviations

CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs (National)
DEAT	former Department of Environmental Affairs and Tourism (National)
EAP	Environmental Assessment Practitioner
EBOSS	Ekurhuleni Biodiversity and Open Space Strategy
EIA	Environmental Impact Assessment
EIP	Environmental Implementation Plan
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ESA	Ecological Support Area
GIS	Geographic Information System
GDARD	Gauteng Department of Agriculture and Rural Development
GTI	Geo Terra Image
IDP	Integrated Development Plan
LUPO	Land-Use Planning Ordinance
MEC	Member of the Executive Committee
Metro	Metropolitan Municipality
NBA	National Biodiversity Assessment 2011
NEMA	National Environmental Management (Act 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NGO	Non-Governmental Organisation
NNR	No Natural Habitat Remaining
NPAES	National Protected Area Expansion Strategy 2008
ONA	Other Natural Area
PA	Protected Area
PE	Protected Environment
SANBI	South African National Biodiversity Institute
SEA	Strategic Environmental Assessment
SDF	Spatial Development Framework
WiW	Working for Water
WHS	World Heritage Site

Acknowledgements

Sections of this Bioregional Plan are adapted from the Bioregional Plan for the Nelson Mandela Bay Municipality produced by Warrick Stewart and Brian Reeves from SRK Consulting (Stewart and Reeves, 2010). The Biodiversity Sector Plans for Garden Route Initiative (Vromans, Maree, Holness, Job and Brown, 2010) and the Guideline Regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans (DEAT 2009) were also used extensively to guide the report structure and content. We would also like to acknowledge Pieta Compaan and Michelle Pfab, the primary authors of the Gauteng C-plan v3.3 (GDARD, 2013), which provides the Ekurhuleni Bioregional Plan with a robust and defensible technical basis. The spatial components of the Bioregional Plan and Gauteng C-plan v3.3 in Ekurhuleni are heavily dependent on areas identified within finescale planning undertaken for the Ekurhuleni Biodiversity and Open Space Strategy (EBOSS).

Preface

This Bioregional Plan was compiled by consultants Dr Stephen Holness and Andrew Skowno of ECOSOL GIS for the Ekurhuleni Metropolitan Municipality, with support from Gauteng Department of Agriculture and Rural Development (GDARD) and financial support from the Grasslands Programme of the South African National Biodiversity Institute (SANBI). This Bioregional Plan was developed in 2010/2011 and is based on analyses performed, and data sets available at that time. The document was improved significantly by a review process in early 2014. One aspect of the analysis (ecosystem protection level categories) was updated in order to align the Bioregional Plan with the National Biodiversity Assessment 2011 (Driver, Sink, Nel, Holness, Van Niekerk, Daniels, Jonas, Majiedt, Harris, & Maze, 2012). The reference list was updated to reflect current publication statuses.

1 Part A: Introduction and Objectives

The Ekurhuleni Metropolitan Municipality informed the Gauteng Province of their intention to declare a bioregion and publish a Bioregional Plan in September 2010. This is the first Bioregional Plan for the area, and hence does not replace any existing bioregional plans (although it is strongly related to the existing Ekurhuleni Biodiversity and Open Space Strategy - EBOSS). The proposed bioregion for the Ekurhuleni Metropolitan Municipality forms part of a larger region covering the Province of Gauteng (Figure 1). Bioregional plans have been developed for each city, metro and district in the province in a parallel process supported by GDARD and SANBI.

Gauteng Province is home to a high proportion of South Africa's mining activity, heavy industry, commercial enterprise and urban population. These activities and characteristics are all associated with land-use change and associated loss or degradation of natural habitats. The pressures placed on the environment and the remaining natural ecosystems are very high, and the loss of natural habitat and ecological processes is expected. Consequently, bioregional plans for each metro are appropriate tools for addressing the threats to biodiversity.

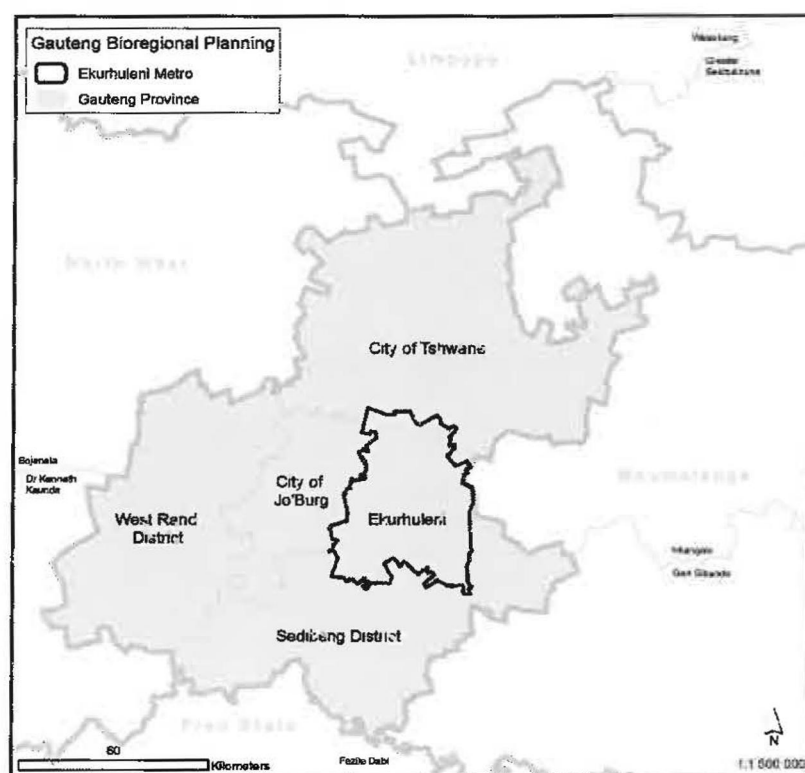


Figure 1. Context map showing the location of the Ekurhuleni Metropolitan Municipality and the extent of the Gauteng Province.

1.1 Purpose and Objectives of the Bioregional Plan

Bioregional plans are one of a range of tools provided for in the National Environmental Management: Biodiversity Act (No. 10 of 2004 - hereafter referred to as the Biodiversity Act) that can be used to facilitate the management and conservation of biodiversity priority areas outside the protected area network. 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. This is done by providing a map of biodiversity priority areas with accompanying land-use planning and decision-making guidelines. Bioregional plans are intended to feed into a range of multi-sectoral planning and assessment processes such as Environmental Management Frameworks (EMFs), Spatial Development Frameworks (SDFs), Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs), and to support and streamline environmental decision-making. A bioregional plan is not in itself a multi-sectoral planning or assessment tool, but rather is the biodiversity sector's input into other planning and assessment processes.

The Bioregional Plan is consistent with National Environmental Management Act (No. 107 of 1998 - hereafter referred to as NEMA) principles and the Biodiversity Act. It is designed to support integrated development planning and sustainable development by identifying an efficient set of Critical Biodiversity Areas that are required to meet biodiversity objectives, in a configuration that is least conflicting with other land-uses and activities. Where alternatives are available, the Critical Biodiversity Areas are designed to avoid conflict with existing IDPs, EMFs and SDFs in the region by favouring the selection of sites that are least conflicting with other land-uses. Within the Ekurhuleni Metro this process was facilitated by strong alignment with spatial priorities identified within the EBOSS.

1.2 Intended Users and Uses of the Bioregional Plan

Bioregional plans are aimed primarily at government and civil society sectors involved in land-use planning and decision-making. The users of the bioregional plan can be divided into **mandatory** users, i.e. those who are compelled to consider the bioregional plan; and **recommended** users, i.e. those who will find it to be a useful planning and developmental tool (Table 1).

The bioregional plan is the official reference for biodiversity priorities to be taken into account in land-use planning and decision-making by all sectors. The bioregional plan has three main uses:

1. Proactive forward planning, serving as an input into mechanisms such as EMFs, SDFs, IDPs, Metropolitan Open Space Systems and zoning schemes;
2. Reactive decision-making, providing guidance for evaluating environmental impact assessments, agricultural land and water-licensing decisions, and development-control decisions through land-use legislation (e.g. rezoning, subdivision and planning approvals).
3. Proactive conservation, providing an input into decisions on the expansion of protected areas through land acquisition by the state and biodiversity stewardship agreements with private or communal landowners.

Table 1. Users of bioregional plans, divided into mandatory and recommended users. Adapted from Nelson Mandela Bay Draft Bioregional Plan (Stewart & Reeves, 2010).

User		Mandatory uses	Recommended uses
Ekurhuleni Metropolitan Municipality		Must align the Bioregional Plan with its Integrated development Plan (IDP) and Spatial Development Framework (SDF) and must demonstrate how the Bioregional Plan may be implemented. Must also take the Bioregional Plan into account in issuing planning authorisations.	Should integrate Critical Biodiversity Areas and other relevant guidelines and recommendations from the Bioregional Plan into Environmental Management Frameworks (EMFs) and zoning schemes in conjunction with additional information contained in the Ekurhuleni Biodiversity and Open Space Strategy (EBOSS).
Any organ of state that must prepare an Environmental Implementation Plan (EIP) or Environmental Management Plan (EMP) in terms of Chapter 3 of NEMA		Must consider the Bioregional Plan in developing the Environmental Implementation Plan or Environmental Management Plan.	
Environmental decision-makers who are required by section 2(1)(c) of NEMA to apply the NEMA section 2 principles in their decision-making	DEA - National Department of Environmental Affairs	Must consider the Bioregional Plan before issuing environmental authorisations on applications dealt with at a national level.	Should take the Bioregional Plan into account in their planning processes and in their programmes.
	GDARD – Gauteng Department of Agriculture and Rural Development	Must consider the Bioregional Plan before issuing environmental authorisations. Should take the Bioregional Plan and identified Critical Biodiversity Areas into account in their comments on applications.	Should take the Bioregional Plan into account when developing provincial supplements to the NEMA EIA regulations, developing EMFs and Provincial Guidelines in terms of EIA regulations. Should require that Environmental Assessment Practitioners (EAPs) refer to the Bioregional Plan in Basic Assessment Reports and Environmental Impact Reports. Should take Bioregional Plan into account in planning LandCare activities, farm planning, ploughing and subdivision applications, land reform and Area- Wide Planning, and in the development of policy, legislation or guidelines for land-use planning and management.

	DAFF – National Department of Agriculture, Forestry and Fisheries		Should take the Bioregional Plan into account in their authorisations. Should take the Bioregional Plan into account in their planning processes and in their programmes.
	DME – National Department of Mineral and Energies		Should take the plan into account in their authorisations for prospecting and mining.
	DID – Gauteng Department of Infrastructure Development		Should take the Bioregional Plan into account when planning infrastructure.
	DRT – Department of Roads and Transport		Should take the Bioregional Plan into account when planning roads and other transport infrastructure.
	DLGH – Gauteng Department of Local Government and Housing		Should take the Bioregional Plan into account when identifying suitable sites for new housing developments.
	Working for Water, Working for Wetlands, LandCare,		Should take the Bioregional Plan into account in planning and scheduling their activities
	Environmental and planning consultants		Should take the Bioregional Plan into account when undertaking Strategic Environmental Assessments and Environmental Impact Assessments or when developing IDPs, SDFs or EMFs for a municipality
	Conservation NGOs		Should use the Bioregional Plan to guide comments on land-use change applications, and to direct conservation initiatives
	Private landowners		Should use the Bioregional Plan if they want more information about the biodiversity value of their landholdings
	Private developers and businesses		Should facilitate their process of obtaining development rights by utilizing the Bioregional Plan to identify appropriate areas for different types of land-use in order to avoid unnecessary delays and costs associated with submitting inappropriate development proposals which are unlikely to be approved.

1.3 Underlying Biodiversity Plan and Limitations

This Bioregional Plan is based on Critical Biodiversity Areas designed and described in Gauteng C-Plan v3.3 (GDARD, 2013), a systematic biodiversity plan developed by the Gauteng Department of Agriculture and Rural Development (GDARD). The Bioregional Plan serves as the primary biodiversity informant to a range of planning processes. However, it is important to recognise that the Bioregional Plan does not replace these planning and decision-making processes, and does not in itself grant or limit land-use rights. Further, the Bioregional Plan has limitations, which although they do not restrict the application of the Bioregional Plan, need to be recognized and appropriately addressed when it is used:

1. The Bioregional Plan does not replace the need for site assessments, particularly for Environmental Impact Assessments. Although it is based on a fine-scale systematic biodiversity plan, this does not remove the need for on-site verification of the identified Critical Biodiversity Areas;
2. The underlying systematic biodiversity plan (Gauteng C-Plan v3.3), on which the Bioregional Plan is based, is designed to be used at a scale of approximately 1:50 000. Although it can be used at a finer scale, this requires specialist interpretation of the specific features identified in the systematic biodiversity plan;
3. The systematic biodiversity plan (Gauteng C-Plan v3.3), on which the Bioregional Plan is based, was developed using appropriate methods and uses the best available data at the time of its development. However, key aspects such as the distribution of threatened species remain incomplete;

Ongoing changes in land-use as well as changes in biodiversity, may impact on the identified network of Critical Biodiversity Areas. It is likely that additional areas would need to be designated as Critical Biodiversity Areas when the Bioregional Plan is revised due to these changes.

2 Part B: Biodiversity Profile

2.1 Significance of the Biodiversity within the Bioregion

The Ekurhuleni Metro contains a disproportionately high percentage of rare and threatened species and threatened ecosystems compared with both the rest of the Gauteng Province and South Africa as a whole. This is a consequence of the combination of its topographic and geological diversity resulting in a diversity of habitats (which in turn support a diversity of species) and the high level of habitat modification that characterises the bioregion.

2.2 Important Terrestrial Features

2.2.1 Threatened Species in the Ekurhuleni Metro

This section is not intended to be a comprehensive review of species found in the bioregion, rather it is a summary of existing information available on threatened species and species of special concern.

- **Plants:** An examination of the threatened plant species records held within the National Herbarium Pretoria Computerised Information System (PRECIS), supplemented by provincial records, shows that 42 threatened plant species are recorded for the Gauteng Province¹. Of these, 16 are found in Ekurhuleni Metro including two Critically Endangered erica species (*Erica baueri* subsp. *baueri* and *Erica jasminiflora*), four Endangered species (*Habenaria mossii*, *Leucadendron daphnoides*, *Leucospermum saxosum* and *Protea laticolor*) and ten Vulnerable species.
- **Mammals:** Two of Gauteng's threatened and special concern mammal species are found in Ekurhuleni Metro, they include the Endangered White-tailed Mouse (*Myodomys albicaudatus*) and the Near-Threatened Spotted-necked Otter (*Lutra maculicollis*).
- **Reptiles:** The range of the globally Near-Threatened Striped Harlequin Snake (*Homoroselaps dorsalis*) extends into Ekurhuleni Metro.
- **Birds:** Eight Vulnerable species and four Near-Threatened species are particularly reliant on the Gauteng region, and a number of others also occur occasionally. Four of these species are found in the Ekurhuleni Metro. These include the Vulnerable African Marsh-Harrier (*Circus ranivorus*) and African Grass-Owl (*Tyto capensis*) both of which are dependent or partially dependent on wetlands, and the Near-Threatened Secretary bird (*Sagittarius serpentarius*) and Melodious Lark (*Mirafra cheniana*).
- **Invertebrates:** Gauteng is important for at least four threatened invertebrate species. One of these, Stobbia's Fruit Chafer Beetle (*Ichneustoma stobbiai*) which is likely to be listed as Vulnerable, is found within Ekurhuleni Metro.

2.2.2 Threatened Ecosystems

Ecosystem threat status refers to the degree to which an ecosystem is still intact, or alternatively losing vital aspects of its structure, function or composition, for example as a result of irreversible loss of natural habitat within that ecosystem. SANBI has developed a system for assessing threat

¹ Based on an analysis of red listed plant species found within the Quarter Degree Squares overlapping the Ekurhuleni Metro and the whole Gauteng Province.

status that uses a suite of criteria to assign national ecosystem status to South African vegetation types. The list of threatened terrestrial ecosystems (hereafter referred to as the National Threatened Ecosystems List) published by the Minister of Environmental Affairs in December 2011, in terms of the National Environmental Management: Biodiversity Act (No. 10 of 2004)), is based largely on South African vegetation types and the degree to which they have been irreversibly modified. According to this list, the Ekurhuleni Metro has a total of ten threatened ecosystems, four of which are considered Critically Endangered, two Endangered and four Vulnerable (Table 2 & 3) (Figure 2). Although much of this habitat has now been irreversibly modified, the original extent of the threatened habitat types covers 87% of the Ekurhuleni Metro.

Table 2. Number of nationally listed threatened ecosystems occurring in the Ekurhuleni Metro and in Gauteng Province.

Number of Threatened Ecosystems	Ekurhuleni Metro	Gauteng Province
Critically Endangered	4	10
Endangered	2	7
Vulnerable	4	7
Total Number of Threatened Ecosystems	10	24

Table 3. Extent in hectares (and percentage extent) of nationally listed threatened ecosystems occurring in the Ekurhuleni Metro and Gauteng Province.

Threatened Ecosystems	Ekurhuleni Metro (ha)	% Extent	Gauteng Province (ha)	% Extent
Critically Endangered	116405	59%	323438	20%
Blesbokspruit Highveld Grassland	38684	20%	92548	6%
Boesmanspruit Highveld Grassland			39715	2%
Bronberg Mountain Bushveld			12743	1%
Glen Austin Pan	267	<1%	458	<1%
Klipriver Highveld Grassland	47189	24%	88787	5%
Magaliesberg Pretoria Mountain Bushveld			10173	1%
Rietvleiriver Highveld Grassland	30266	15%	40207	2%
Roodepoort Reef Mountain Bushveld			13978	1%
Wilge Mountain Bushveld			6347	<1%
Witwatersberg Pretoria Mountain Bushveld			18481	1%
Endangered	20979	11%	234248	14%
Brakfontein Reef Bushveld			1680	<1%
Bronkhorstspuit Highveld Grassland			12814	1%
Deneysville Highveld Grassland			9034	1%
Egoli Granite Grassland	5349	3%	103557	6%
Kraanspoort Mountain Bushveld			12034	1%
Tsakane Clay Grassland	15630	8%	58834	4%
Witwatersberg Skeerpoort Mountain Bushveld			36296	2%
Vulnerable	33655	17%	609653	37%

Eastern Highveld Grassland	3198	2%	7447	<1%
Eastern Temperate Freshwater Wetlands	237	<1%	1654	<1%
Magaliesberg Hekpoort Mountain Bushveld			6029	<1%
Marikana Thornveld			93296	6%
Rand Highveld Grassland	2602	1%	168042	10%
Soweto Highveld Grassland	27829	14%	304401	18%
Springbokvlakte Thornveld			28784	2%
Total Not Threatened Extent	26492	13%	487439	29%
Total Threatened Ecosystem Extent	171039	87%	1167339	71%
Total	197531	100%	1654779	100%

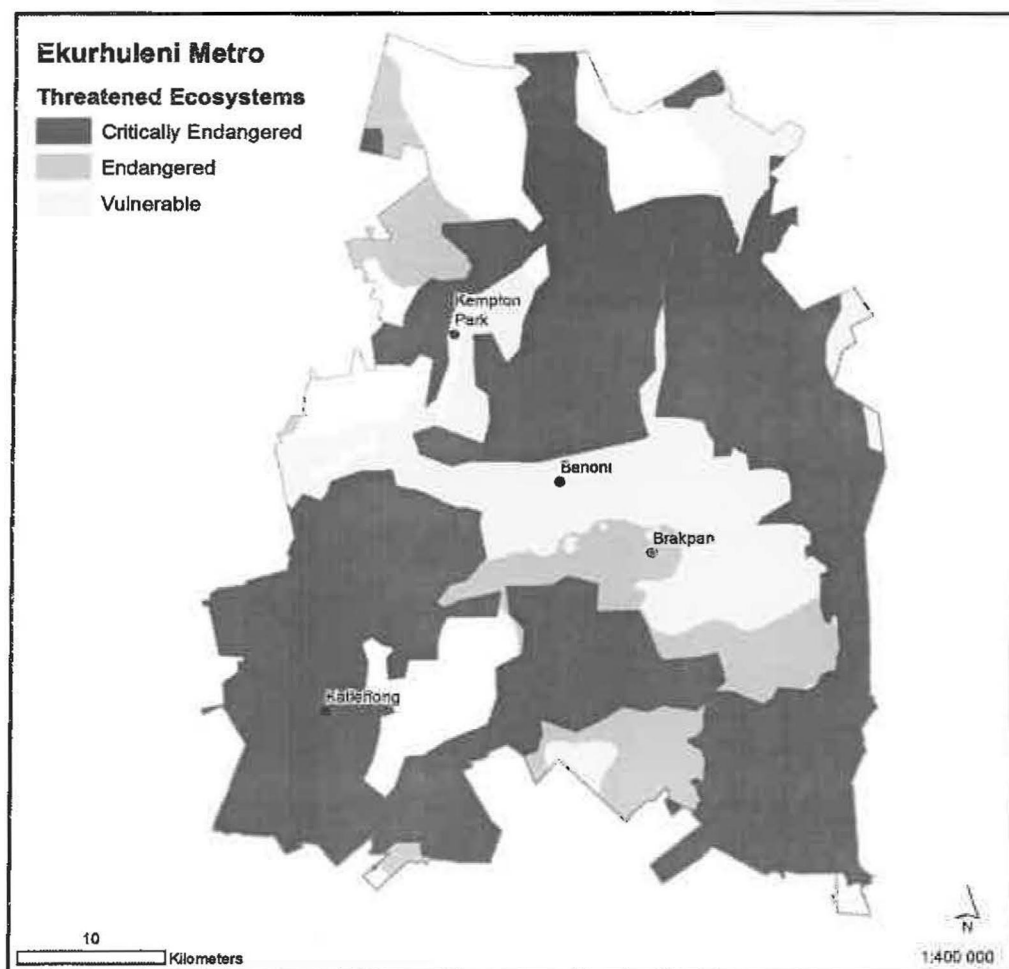


Figure 2. Nationally listed threatened ecosystems in the Ekurhuleni Metro. Refer to Table 3 for more detail.

2.3 Important Freshwater Features

The Ekurhuleni Metro contains a high diversity of river and wetland ecosystems. The National Freshwater Ecosystem Priority Areas (NFEPA) project (Nel *et al.*, 2011) identified 30 unique wetland types and seven river types in the area (Table 4). The Ekurhuleni Metro contains a high portion of South Africa's urban, industrial and mining activity, as well as significant areas of cultivated lands, all of which potentially negatively impact on the condition of hydrological systems. Impacts include changes in water quality (e.g. acid mine drainage, waste water from treatment plants, fertilizer and pesticide runoff) and water flow regimes (e.g. catchment hardening and increased storm water flows). Consequently, 97% of the wetland ecosystem types and 29% of the river ecosystem types are threatened (Driver and Nel, 2012) (Table 4, Figure 3).

Table 4. River and wetland ecosystem threat status in Ekurhuleni Metro

River and Wetland Threat Status	Number of Critically Endangered Types	Number of Endangered Types	Number of Vulnerable Types	Number of Least Threatened Types	Total
Wetlands	20	8	1	1	30
Rivers	0	0	2	5	7
Total	20	8	3	6	37

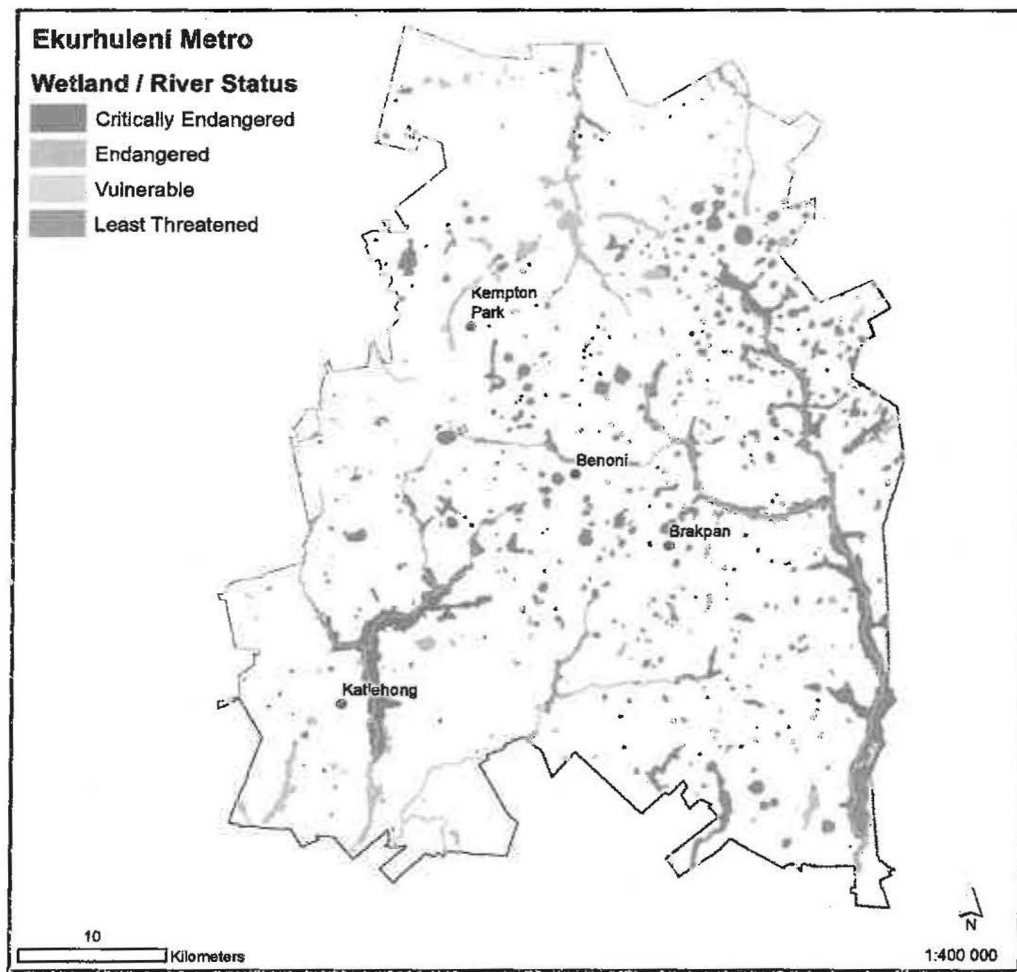


Figure 3. Threatened wetland ecosystems types and river ecosystem types in the Ekurhuleni Metro identified in the National Freshwater Ecosystems Priority Areas Project (Nel *et al.*, 2011).

2.4 Important Ecological Processes (including climate change mitigation and adaptation)

The Ekurhuleni Metropolitan Municipality is also important for supporting a range of ecological processes which are critical for ensuring long term persistence of biodiversity and the delivery of ecosystem services, especially in the context of climate change. Protection of intact natural habitat in an ecologically viable configuration (as would be achieved by implementing the Bioregional Plan) should be the primary climate change adaptation approach taken by the Metro authorities. Key ecological process issues include:

Hydrological processes: In addition to the importance of the aquatic ecosystem types outlined in the previous section, the area is important for supporting a range of key hydrological processes which are significant well beyond the boundaries of the bioregion. Hydrological changes in the Witwatersrand can impact much of the country through downstream impacts on

the major Gariep and Limpopo river systems. Dolomite and wetland ecosystems play a major role in controlling the hydrology of the region. Climate change impacts are likely to increase the value of maintaining intact or at least functioning hydrological systems.

Climate change mitigation: Forest, woodland, wetland, and even grassland ecosystems, play an important role in carbon sequestration and protection of remaining intact areas of natural habitat is, therefore, a priority. Keeping sufficient habitat intact is important for minimizing the long term magnitude of climate change events. Although the role of the Metro is small in a global context, it is important that all areas contribute to climate change mitigation.

Climate change adaptation: Ecological process Issues important for climate change adaptation include -

Corridors and connectivity: The high levels of habitat loss and urban infrastructure development in the Grassland biome in general, and Gauteng Province in particular, strongly restrict connectivity of ecosystems at a national level. Gauteng can be seen as a key bottleneck or restriction in west-east ecological connectivity, which can impact on the long term survival of a variety of species and ecosystems in the context of ongoing climate change. Maintaining ecological connectivity is critical for long term persistence of biodiversity in the face of ongoing climate change, and represents the major contribution which the Ekurhuleni Bioregion can make to facilitating climate change adaptation within the Gauteng Province, and South Africa as a whole.

Climate change refugia and areas of high diversity: The Gauteng biodiversity assessment process identified a number of key areas that exhibit a high diversity of environmental parameters in relatively small areas. These high value areas exist because of the relatively large topographic and geological diversity of the region. These areas should be identified within a bioregional plan as they are critical for ensuring the long term persistence of both species and ecosystems, as they include both the ecological gradients required to allow species and habitats to adjust to climate change impacts and are likely to include refuge areas. In addition, ridges and higher altitude areas are important.

Areas for minimizing climate change impacts on society: Climate change is likely to result in significant increases in climate variability. In the urban context, perhaps the most important consequence is an increase in the likelihood of extreme flood events. Protection of intact natural habitat (especially wetlands, floodplains and intact riparian habitat) is extremely important for reducing the magnitude of flood events as these areas play an important role in regulating hydrological processes such as storm runoff. In addition, these areas (especially floodplains) are at extremely high risk of being affected by events such as floods, so ensuring that infrastructure development and agricultural activity is avoided where possible in high risk areas will reduce the long term impact of climate change, particularly on poor communities.

2.5 Patterns of Land-Use

According to the recent Gauteng land cover (GTI, 2009), land cover patterns in the Ekurhuleni Metro are characterised by high levels of habitat loss and urban development, with only 36% of the Metro in a natural state and 64% severely or irreversibly modified (Table 5, Figure 4). Intensive agriculture covers 23% of the Ekurhuleni Metro, and mining and urban development 7% and 35%

respectively. The overall levels of habitat loss for the Gauteng Province (44%) are significantly lower than for Ekurhuleni Metro (64%).

Table 5. Land Cover Classes in the Ekurhuleni Metro and Gauteng Province. Extent in hectares (ha).

Land Cover Level 1	Level 2	Ekurhuleni Metro	% Extent	Gauteng Province	% Extent
Natural	Natural - Terrestrial	55515	28%	951308	52%
	Natural - Aquatic	15279	8%	70631	4%
Natural SubTotal		70794	36%	1021939	56%
Irreversible Modification	Intensive Agriculture	45245	23%	445606	25%
	Urban	68637	35%	291750	16%
	Mining	12855	7%	58538	3%
Irreversible Modification Sub-Total		126737	64%	795894	44%
Total		197531		1817833	

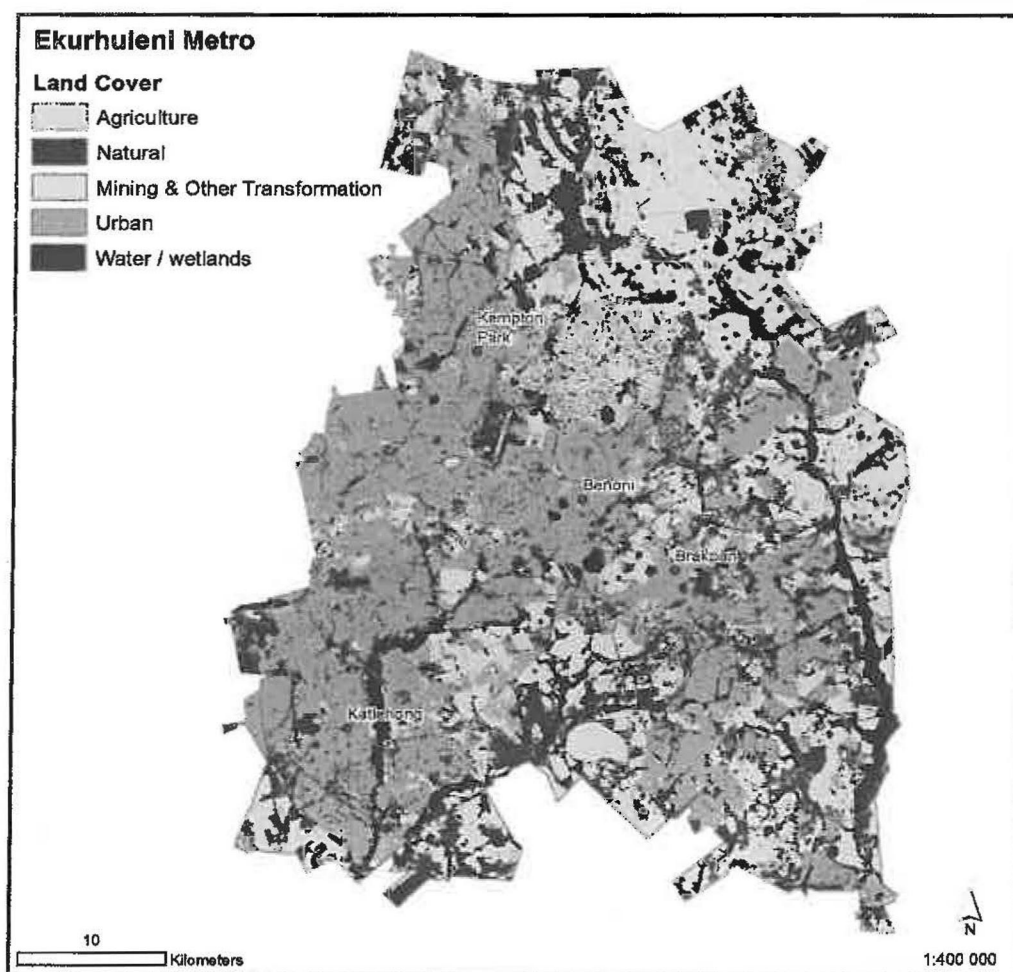


Figure 4. Land cover patterns in the Ekurhuleni Metro (GTI, 2009)

2.6 Ecosystem Protection Levels within the Ekurhuleni Metro

'Ecosystem protection level' is a measure of how well an ecosystem is represented in the existing protected area network. It is calculated as the proportion of the biodiversity target for each vegetation type (i.e. ecosystem) that is included in the protected area network (Government of South Africa, 2010).

According to the National Biodiversity Assessment (Driver *et al.*, 2012) an ecosystem is considered "not protected" if under 5% of its biodiversity target is met within protected areas; "poorly protected" if 5-49% of its biodiversity target is met in protected areas; and "moderately protected" if 50-99 % of its biodiversity target is met. If more than 100% of the biodiversity target is met in protected areas it is considered "well protected". Three ecosystems in the Ekurhuleni Metro are not protected, four are poorly protected, two are moderately protected and none are well protected (Table 6, Figure 5).

Ecosystem protection levels are important in the context of a bioregional plan as they give an indication of which ecosystem types are not sufficiently protected in formal protected areas that have secure, legal tenure. The long-term persistence of these ecosystem types is largely dependent on the land-use controls and other mechanisms influenced by a bioregional plan. Overall, this is the case throughout the Gauteng Province which is dominated by ecosystem types that are insufficiently protected in formal protected areas. Conversely, ecosystem types that are moderately or well-protected in formal protected areas are not likely to require the same level of attention within a bioregional plan. There may, however, be other reasons (e.g. ecological process areas or species of special concern) why portions of well protected ecosystem types may be included in Critical Biodiversity Areas or Ecological Support Areas identified in bioregional plans.

It is important to note that the protection levels of ecosystems used in this section are aligned with the NBA 2011 (Driver *et al.*, 2012) categories which are based only on formal Protected Areas. These are areas such as National Parks, legally-declared Nature Reserves, World Heritage Sites and Protected Environments which are secured by appropriate legal mechanisms such as declaration under the Protected Areas Act. Importantly, and in contrast, the Gauteng C-Plan v3.3 uses a different definition of protected areas which includes some undeclared conservation areas, and excludes some legally declared protected area types such as Protected Environments and World Heritage Sites (see footnote in section 2.8.2).

Table 6. Ecosystem protection levels for Ekurhuleni Metro. Extent in hectares (ha).

Vegetation type	Extent in ha
Not protected	82255
Eastern Highveld Grassland	23263
Rand Highveld Grassland	5755
Soweto Highveld Grassland	53237
Poorly protected	111410
Carletonville Dolomite Grassland	50571
Eastern Temperate Freshwater Wetlands	7953
Egoli Granite Grassland	6048
Tsakane Clay Grassland	46838
Moderately protected	3865
Andesite Mountain Bushveld	3402
Gold Reef Mountain Bushveld	463
Well protected	0
NA	

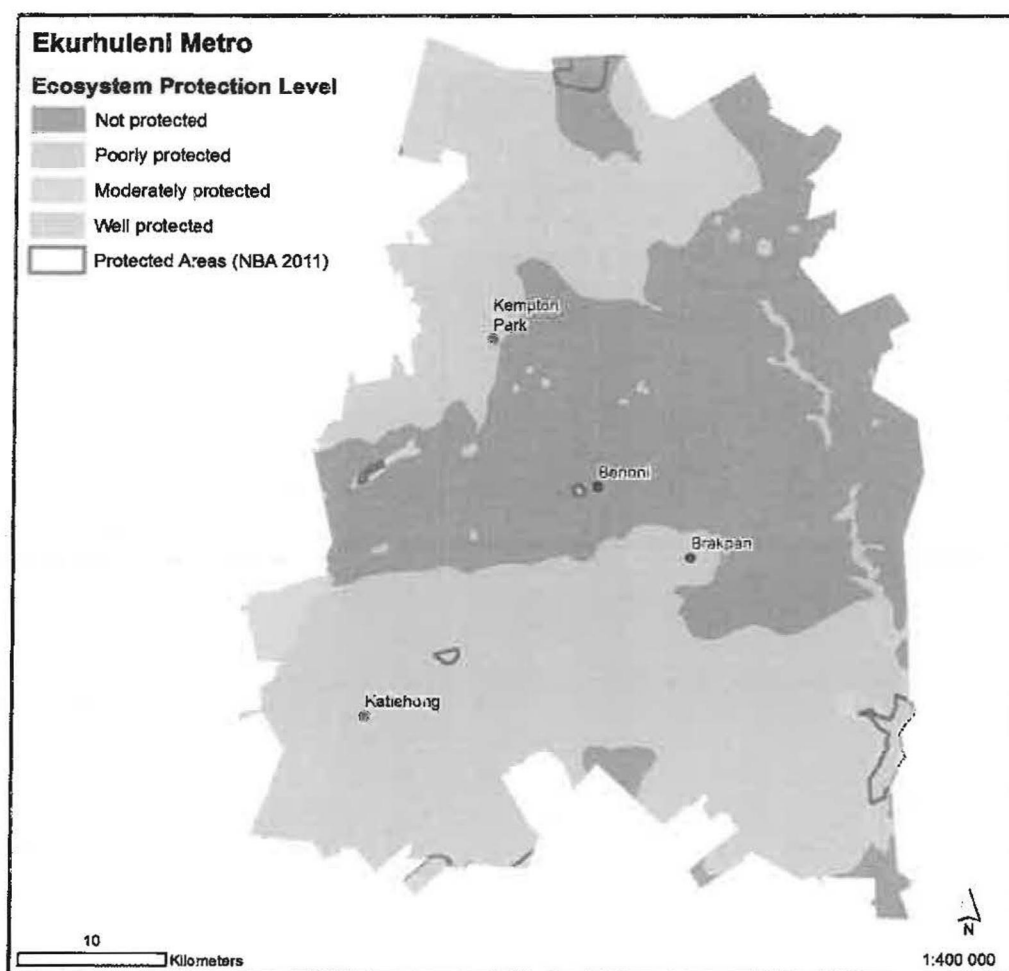


Figure 5. Ecosystem protection levels in the Ekurhuleni Metro.

2.7 Why is a Bioregional Plan Necessary?

A bioregional plan for the Ekurhuleni Metro is justified on the following grounds:

Biodiversity value: The region contains a relatively large number of ecosystems and species, as a consequence of its topographic and geological diversity. Further, the area supports important ecological processes, especially processes associated with wetland and river systems.

Threatened species and ecosystems: Much of the biodiversity in the Metro is threatened, with the area supporting a number of threatened species, particularly plants. 69% of the total area of the Metro has been identified as threatened according to the National List of Threatened Ecosystems, while 97% of the wetland ecosystem types and 29% of the river ecosystem types are threatened.

Nature of the pressures on biodiversity: The key pressures on biodiversity in the Gauteng Province are linked to rapid land-use change, particularly urban and industrial development. Thus, a bioregional plan, which is primarily aimed at influencing decision-making processes related to land-use planning, is the appropriate intervention tool.

Lack of viable alternative methods to protect biodiversity: Although protected area expansion through land purchase and biodiversity stewardship can play an important role in protecting specific sites, the combination of high levels of habitat loss, numerous development pressures, and high land value, is likely to preclude protected area expansion from being the dominant conservation mechanism in the region. Most ecosystems remain poorly protected, and scope for protected area expansion is relatively limited. Hence the use of controls related to land-use (e.g. zoning schemes, SDFs, Metropolitan Open Space Systems), infrastructural development approvals (both strategically using Environmental Management Frameworks and reactively via the Environmental Impact Assessment process) and interventions such as implementing an appropriate Metropolitan Open Space System - all of which should be influenced by a bioregional plan - represent the best prospect for ensuring long-term persistence of biodiversity in the Metro.

Need to formalize status of areas identified in the Ekurhuleni Biodiversity and Open Space Strategy: Publishing the Ekurhuleni Bioregional Plan will improve the status and recognition of priority conservation areas identified in the EBOSS. This is important as although the EBOSS has been officially ratified by the Ekurhuleni Metropolitan Municipality, it does not have legal standing outside of the Metro.

2.8 Requirement for a systematic biodiversity plan

According to the Guideline for Bioregional Plans (DEAT, 2009) a bioregional plan must be a spatial plan showing terrestrial and aquatic features in the landscape that are critical for the persistence of biodiversity and maintenance of ecosystem functioning. A bioregional plan must be based on a systematic biodiversity plan, which is a rigorous, data-driven approach for assessing the location, status and importance of a range of biodiversity features. In addition to the general requirement for a systematic biodiversity plan, the guidelines specify a range of key characteristics that a biodiversity plan would need to have before it can be considered to be systematic, and further details a number of specific issues that need to be addressed in the systematic biodiversity plan.

This Bioregional Plan for the Ekurhuleni Metro, is based on Gauteng C-Plan version v3.3, which is a systematic biodiversity plan that was developed by the GDARD. The spatial priorities are heavily influenced by fine-scale planning undertaken for the Ekurhuleni Biodiversity and Open Space Strategy. Details of the biodiversity planning process are described in the technical documentation provided with Gauteng C-Plan v3.3.

3 Part C: Critical Biodiversity Areas map, categories and description

3.1 Description of Critical Biodiversity Areas and Ecological Support Areas

Critical Biodiversity Areas are the portfolio of sites that are required to meet the region's biodiversity targets, and that need to be maintained in the appropriate condition for their category. A map of CBAs for Gauteng was produced as part of the Gauteng C-Plan v3.3 process and sites were assigned to CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting biodiversity targets for both biodiversity pattern and ecological processes (see Table 7).

In order to meet the requirements for publishing a bioregional plan, and to allow specific land-use guidelines to be developed, the broad provincial categories of Critical Biodiversity Area used in Gauteng C-Plan v3.3 were split into two sub-categories on the basis of land cover and the underlying biodiversity features, as follows: Critical Biodiversity Area 1 (CBA1), which are areas that need to remain in a largely natural state, and Critical Biodiversity Area 2 (CBA 2), which are intensive agricultural areas (including cultivated fields) that have importance for supporting threatened species, and which should be maintained under their current agricultural land use rather than in a natural state. Ecological Support Areas were identified which are areas that are important for maintaining the ecological processes on which CBAs depend. Again, these were split into two categories based on their current ecological condition: Ecological Support Area 1 (ESA 1), are largely natural or near-natural landscapes which are important for preventing degradation of Critical Biodiversity Areas and Protected Areas, and are particularly focussed on the maintenance of ecological processes (e.g. river buffers helping to moderate water flow during floods) – these should be maintained in a natural or near-natural state; while Ecological Support Area 2 (ESA 2) are highly modified areas which potentially retain some value for supporting ecological processes and where additional impacts on ecological processes should be avoided.

Other categories included in the CBA map² are Protected Areas³; Other Natural Areas, which are areas that still contain natural habitat but are not required to meet biodiversity targets; and No Natural Areas Remaining, which are areas identified in Gauteng C-Plan v3.3 as having no remaining intact, natural habitat.

² A CBA Map in this context refers to a map showing all the Critical Biodiversity Areas, Ecological Support Areas, Protected Areas, other natural areas, and no natural areas remaining.

³ The protected area definition used in Gauteng C-Plan v3.3 deviates from national policy documents and guidelines (Protected Areas Act, NBA 2011 & NPAES 2008) which include all formally proclaimed protected areas (including World Heritage Sites and Protected Environments) and exclude undeclared conservation areas which do not have secure legal status. Gauteng C-Plan v3.3 includes most types of formal Protected Area but excludes Protected Environments and World Heritage Sites (which are considered PAs under Protected Areas Act), and includes undeclared private nature reserves and natural heritage sites that have biodiversity focussed management plans in place (these would be categorised as informal conservation areas under the National Protected Area Expansion Strategy and would not be seen to be formally meeting Protected Area targets). **Note these differences are not significant in Ekurhuleni Metro** as both PA layers are the same. In other parts of Gauteng the differences are significant.

Table 7. Criteria used to define the CBA map categories.

CBA MAP CATEGORY	CRITERIA DEFINING THE CATEGORY
Protected Areas	Protected Areas include Provincial Nature Reserves (declared under the National Environment Management: Protected Areas Act 57 of 2003); Municipal Nature Reserves (including Bird Sanctuaries) which are declared under various local and provincial declarations and by-laws; other state owned protected areas (Meteorite Crater Reserve & natural portions of Botanical Gardens); and Private Nature Reserves and Natural Heritage Sites with management plans that have biodiversity conservation as the primary objective. The Protected Area definition used in Gauteng C-Plan v3.3, which this bioregional plan is obligated to follow, deviates from national policy documents and guidelines (Protected Areas Act, NBA 2011 & NPAES 2008) which include all formally proclaimed protected areas (including World Heritage Sites and Protected Environments) and exclude undeclared conservation areas which do not have secure legal status. Gauteng C-Plan v3.3 includes most types of formal Protected Area, but deviated from the norm by excluding Protected Environments and World Heritage Sites, while including undeclared private nature reserves and natural heritage sites that have biodiversity focussed management plans in place (these would be categorised as informal conservation areas under the National Protected Area Expansion Strategy and would not be seen to be meeting Protected Area targets). Protected Environments and World Heritage sites are indicated on the maps to improve alignment with national bioregional plan norms, but the Bioregional Plan does not have the mandate to alter the spatial product from Gauteng C-Plan v3.3.
Critical Biodiversity Areas 1	Any natural or near-natural terrestrial or aquatic area required to meet targets for biodiversity pattern and/or ecological processes. These include any area that is required for meeting biodiversity pattern targets such as remaining areas of Critically Endangered vegetation types and areas required to protect threatened species; any area that is required for meeting targets for ecological processes such as areas important for climate change adaptation; and hydrological process areas such as high priority wetlands and catchments, pan clusters and pans within priority catchments. In addition to the above areas where there is little or no choice of area identified, CBAs include all 'best design' sites in terms of meeting pattern and process targets, identified by the biodiversity planning process. 'Best design' refers to an identified network of natural or near-natural sites that meet pattern and process targets in a spatially efficient and ecologically robust way, and aim to avoid conflict with other activities (e.g. economic activity) where possible.
Critical Biodiversity Areas 2	Intensive agricultural landscapes which are required to meet biodiversity targets for threatened species or which support ecological processes on which these threatened species directly depend. Although the biodiversity planning process preferentially attempted to meet biodiversity targets in natural or near-natural landscapes, in some cases intensive agricultural landscapes may perform a key role in maintaining populations of threatened species (e.g. ploughed fields may be key foraging areas for threatened bird species such as Blue Cranes or Secretary Birds).
Ecological Support Area 1	Natural, near-natural or degraded areas required to be maintained in an ecologically functional state to support Critical Biodiversity Areas and/or Protected Areas. These include remaining floodplain, corridor, catchment, wetland and other ecological process areas that have not been identified as Critical Biodiversity Areas but which need to be maintained in a functional state to prevent degradation of CBAs and/or Protected Areas. ESA1s can include areas which would otherwise have been identified as CBAs except that have been degraded, but which are currently or potentially still important for supporting ecological processes. These areas are a focus for rehabilitation rather than the intensification of land uses.
Ecological Support Area 2	Areas with no natural habitat which retain potential importance for supporting ecological processes. These include urban and intensive agricultural landscapes on floodplains, in buffers around wetlands and in bottlenecks in key climate change corridors. Inappropriate management or intensification of

	land-use in these areas could result in additional impacts on ecological processes.
Other Natural Areas	Natural areas not included in the above categories.
No Natural Areas Remaining	These areas include intensive agriculture, plantations, mined areas, urban areas, infrastructure and dams.

According to the Gauteng C-Plan v3.3, 18% of the Ekurhuleni Metro falls into Critical Biodiversity Areas. These CBAs have been split into CBA 1 and CBA 2 on the basis of their degree of habitat modification and the underlying biodiversity features which are being protected. The majority of the CBAs in the metro are CBA 1 (17%) while 1% of the Metro falls into CBA 2. An additional 18% of the Metro is designated as Ecological Support Areas; this has also been split on the basis of habitat modification into ESA 1 (6%) and ESA 2 (12%). Other Natural Areas make up 12% of the Metro and just over 1% of the Metro falls into Protected Areas (Figure 6, Table 8). The high proportion of remaining natural habitat which has been designated as Critical Biodiversity Area 1 is a function of the relatively high levels of important biodiversity found within the Metro as well as the high levels of urban development and intensive agriculture.

Table 8. The extent (in hectares) and percentage extent of Critical Biodiversity Areas and Ecological Support Areas identified by Gauteng C-Plan v3.3 in the Ekurhuleni Metro and in the whole Gauteng Province.

CBA Category	Ekurhuleni Metro	% Extent	Gauteng Province	% Extent
Protected Area	2641	1%	43948	2%
Critical Biodiversity Area 1	33303	17%	413684	23%
Critical Biodiversity Area 2	2566	1%	14311	1%
Ecological Support Area 1	11372	6%	178195	10%
Ecological Support Area 2	23427	12%	154330	8%
Other Natural Areas	23780	12%	389346	21%
No Natural Area Remaining	100442	51%	624018	34%
Total	197531	100%	1817833	100%

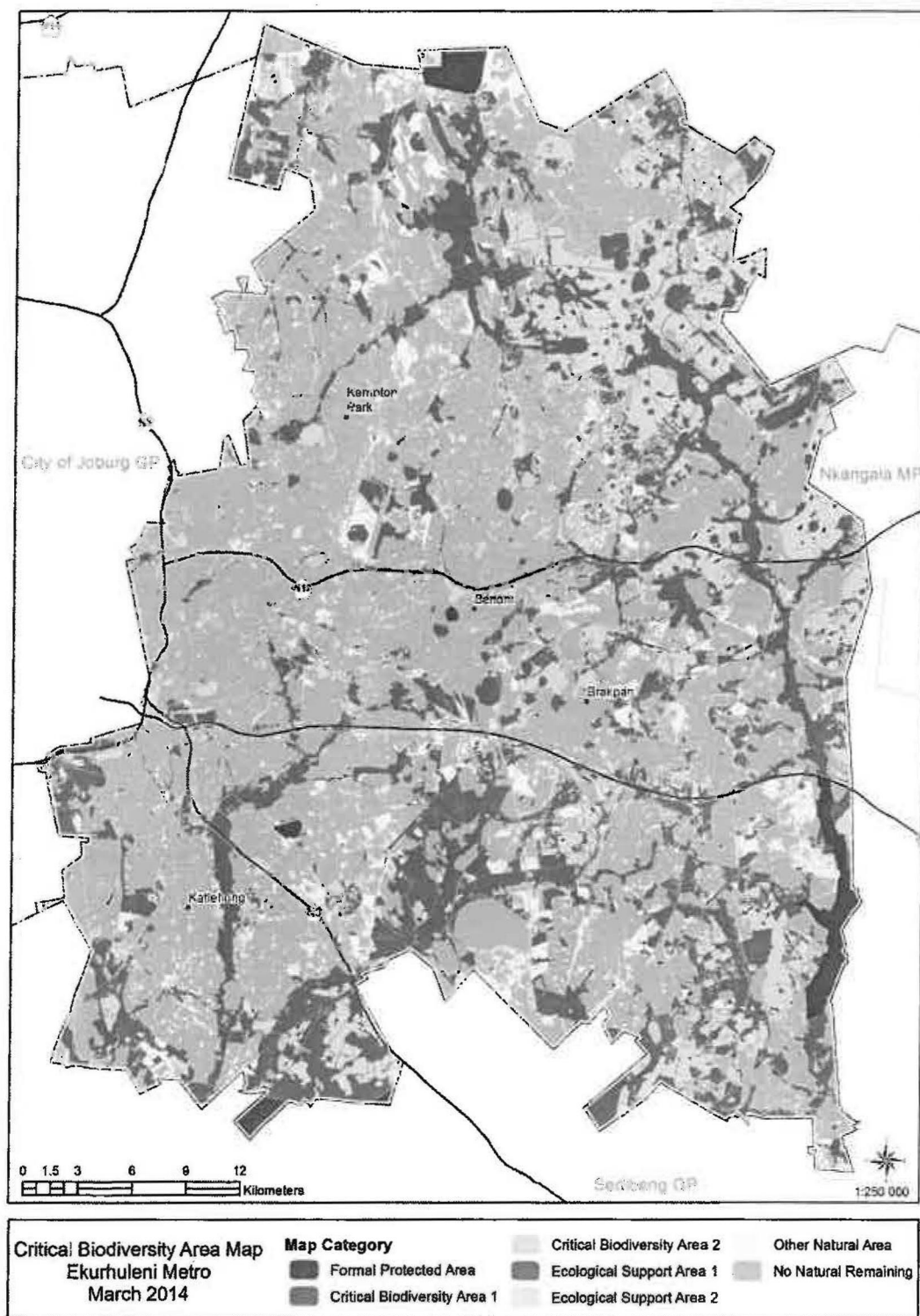


Figure 6. Critical Biodiversity Areas and Ecological Support Areas for the Ekurhuleni Metro. See Table 7 for category definitions.

4 Part D: Guidelines

This section contains guidelines on land-uses that are compatible with the objectives of each category on the Critical Biodiversity Area map. Table 9 is the summary of biodiversity-compatible land-use guidelines, and includes a description of each category, the overall land management objectives for land within that category, recommendations for appropriate management and details of compatible and incompatible land-uses. The guidelines for compatible and incompatible land-uses are designed to aid planners to identify the appropriate land-use zones and controls to impose on areas designated as Critical Biodiversity Areas or Ecological Support Areas when developing Spatial Development Frameworks, Environmental Management Frameworks or similar strategic land-use planning tools. The guidelines also give the evaluators of Environmental Impact Assessments an indication of appropriate land-use within each map category. Importantly, the Bioregional Plan only provides guidance on appropriate land-uses and activities and does not in itself grant or remove land development rights.

Table 10 contains broader land management guidelines for areas within each category on the Critical Biodiversity Area map. The recommendations are designed to inform a wide range of land-use planning and decision-making processes, as well as conservation implementation activities. The recommendations only provide guidance to decision-makers and serve as an informant to planning processes on appropriate land management and activities and do not in themselves grant or remove land development rights.

Table 9. Biodiversity-compatible land-use guidelines for each category on the Critical Biodiversity Area map.

Category on the CBA Map	Description	Land Management Objective	Land Management Recommendations	Compatible Land-Use	Incompatible Land-Use
Protected Areas	Formal Protected Areas and Protected Areas pending declaration under Protected Areas Act. ⁴	Maintain natural land. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation.	Maintain or obtain formal conservation protection.	Biodiversity Conservation and associated activities.	All other land-uses.
Critical Biodiversity Areas (1)	Areas required to be maintained in a natural or near natural state to meet targets for biodiversity pattern (features) or ecological processes.	Maintain natural land and ecological processes. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation.	Obtain formal conservation protection where possible. Implement appropriate zoning to avoid net loss of intact habitat or intensification of land-use.	Conservation and associated activities. Extensive game farming (i.e. over large areas and at low intensity) and eco-tourism operations with strict control on environmental impacts and carrying capacities, where overall a biodiversity compatible land use is secured across a property. Extensive Livestock Production on natural rangeland with strict control on environmental impacts and carrying capacities. Urban Open Space Systems	Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, pipelines and power lines ⁵), Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures). Cultivation (dry land & irrigated cropping) and forestry. Small holdings
Critical Biodiversity Area (2)	Cultivated landscapes which retain importance for supporting threatened species			Maintain current agricultural activities. Ensure that land-use is not intensified and that activities are managed to minimize impact on threatened species.	Avoid conversion of agricultural land to more intensive land-uses which may have a negative impact on threatened species or ecological processes.

⁴ Note that in terms of accepted national practice, this category should be limited to formal Protected Areas legally secured under the Protected Areas Act or equivalent legislation, and further should include all of these areas. However, Gauteng C-Plan v3.3 anomalously did not include all types of formal Protected Areas (with World Heritage Sites and Protected Environments being excluded) while some informal conservation areas (e.g. undeclared private nature reserves and certain other categories of state land where there is some conservation management) were included in this category. Refer to Table 7 for a full explanation of the discrepancies.

⁵ For grasslands, power lines can be a compatible land use if they are appropriately planned, they keep out of wetlands and areas where threatened birds breed/feed, and do not lead to ecosystem fragmentation.

Category on the CBA Map	Description	Land Management Objective	Land Management Recommendations	Compatible Land-Use	Incompatible Land-Use
Ecological Support Areas (1)	Natural, near natural and degraded areas required to be maintained in an ecologically functional state to support Critical Biodiversity Areas.	Maintain ecological processes.	Implement appropriate zoning and land management guidelines to avoid impacting ecological processes such as key landscape corridors and linkages and avoiding areas important for hydrological processes (e.g. floodplains). Avoid intensification of land-use.	Conservation and associated activities. Extensive game farming and eco-tourism operations. Extensive Livestock Production (i.e. over large areas at low intensity). Urban Open Space Systems. Low density rural residential, smallholdings or resorts where development design and overall development densities allow maintenance of ecological functioning.	Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial Infrastructure (roads, pipelines) excluding power lines which are compatible with Ecological Support Areas so long as they are designed to avoid impacting on processes such as water flow. Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures) Agriculture (dry land & irrigated cropping) and forestry. Small holdings Note: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to maintain overall ecological functioning of ESAs.
Ecological Support Areas (2)	Areas with no natural habitat which retain potential importance for supporting ecological processes.	Avoid additional impacts on ecological processes.	Avoid intensification of land-use, which may result in additional impact on ecological processes.	Existing activities (e.g. agriculture) should be maintained, but where possible a transition to less intensive land-uses should be favoured.	Any land-use or activity which results in additional impacts on ecological functioning, mostly associated with the intensification of land-use in these areas (e.g. Change of floodplain from cultivation to an urban land-use or from recreational fields and parks to urban).
Other Natural Areas	Natural and intact but not required to meet biodiversity targets, or identified as Critical Biodiversity Areas or Ecological Support Areas.		No management objectives, land management recommendations or land-use guidelines are provided as these areas are outside the ambit of the Bioregional Plan. These areas are nevertheless subject to all applicable town and regional planning guidelines and policy. Where possible, existing severely modified areas should be favoured for infrastructure development before "Other natural areas" may later be required either due to the identification of previously unknown important biodiversity features on these sites, or alternatively where the loss of "Critical Biodiversity Areas" has resulted in the need to identify alternative sites.		
No natural habitat remaining	Irreversibly modified or degraded areas which are not required as Ecological Support Areas, including intensive agriculture, urban development, industry, and infrastructure.				

Table 10. Recommended land management guidelines in Critical Biodiversity Areas and Ecological Support Areas.

CRITICAL BIODIVERSITY AREAS ONE	
Keep in a NATURAL STATE	
General Recommendations	
<ul style="list-style-type: none"> • No further loss of natural habitat should occur i.e. all land in this category should be maintained as natural vegetation cover; • These areas of land can act as possible biodiversity offset receiving areas; • Prioritise CBAs for land care projects, Working for Water (WW) and NGOs to direct their conservation projects, programmes and activities; • An Ecological Management Plan should be compiled where required for CBAs. EMP to include invasive alien plant control, fire management etc; • Control of illegal activities (such as hunting and dumping) which impact biodiversity should be prioritized in CBA areas. 	
Protection	
<ul style="list-style-type: none"> • CBAs not formally protected should be rezoned to conservation or appropriate open space zoning, and where possible declared in terms of the Protected Areas Act. The Stewardship program should prioritise privately owned erven in CBAs to be incorporated into the protected area network through Conservation Agreements and incentives (e.g. rates rebates); • Maintain and legally protect the Open Space System that maintains CBAs. 	
Rehabilitation	
<ul style="list-style-type: none"> • Degraded or disturbed CBAs should be prioritized for rehabilitation through programmes such as Working for Water, Working for Wetlands. 	
Development Guidelines	
Where infrastructure is proposed, the following guidelines should be implemented -	
<ul style="list-style-type: none"> • Rezoning of properties to afford additional land-use rights that will result in increased biodiversity loss should not be granted; • Permission to increase the permitted number of units per erf or per ha should not be granted; • Infrastructure developments should be limited to existing developed / degraded footprints, if present; • Units carefully dispersed or clumped to achieve least impact, particularly with regard to habitat loss and fragmentation; • The installation of infrastructure in CBAs is not desirable and should only be considered if all alternative alignment and design options have been assessed and found to be non-viable. Under such conditions, at least a Basic Assessment should be undertaken, and if approved, a comprehensive Environmental Management Plan must be developed and best-practice restoration efforts strictly implemented; • Ecological Specialist to conduct the ecological assessment; • A Construction & Operational Environmental Management Plan should be compiled and implemented. 	
Where development proposals other than the preferred biodiversity-compatible land-uses (see table above are submitted in terms of the NEMA: EIA regulations or Land-Use Planning Ordinance (LUPO):	

- A Screening Exercise should be undertaken by a Biodiversity Specialist or Ecologist to verify the CBA map category on site;
- If the site is verified as a CBA, land-uses other than Conservation Use should be identified as a 'Fatal Flaw';
- If the application is pursued they should be informed by a specialist biodiversity assessment.

Aquatic Ecosystems

- Maintain water quality and flow regimes should be maintained as close to natural as possible;
- Where Environmental Reserves or Environmental Flow Requirements have been determined these should be strictly adhered to;
- All effluent (including municipal, mining and industrial waste water) as well as acid mine drainage should be treated to required specifications before release;
- Stormwater flow should be managed to avoid damage to CBA areas.
- Where CBAs include floodplains (e.g. areas within the 1:100 year floodline), riparian areas (e.g. as a minimum, the 32m around rivers) or buffers around wetlands, particular attention should be applied to ensure that these remain in a natural state or are rehabilitated to this state. In addition to avoiding habitat loss or degradation, other activities such as livestock access may need to be controlled and invasive alien vegetation managed to avoid damage to banks. Do not permit infilling, excavation, drainage, hardened surfaces (including buildings and asphalt), intensive agriculture or any new infrastructure developments within a river or wetland.
- Areas that are degraded or disturbed should be rehabilitated, through programmes such as Working for Water, Working for Wetlands and a systematic invasive alien vegetation eradication programme implemented.

CRITICAL BIODIVERSITY AREA TWO

Maintain as an **AGRICULTURAL LANDSCAPE**

General Recommendations

- Avoid conversion of agricultural land to more intensive land-uses which may have a negative impact on threatened species or the ecological processes which support these species.
- Agricultural activities should be managed to avoid impacts on the specific threatened species dependent on these areas.
- Intensification of land-use in these areas should be avoided.
- Should there be any remaining areas intact habitat in this category, these areas should be treated as Critical Biodiversity Area One, and no further loss of natural habitat should occur;
- These areas of land would be the focus of threatened species specific management interventions by conservation agencies and NGOs;
- Species management plans may be necessary in these areas.
- Control of illegal activities (such as hunting and dumping) which impact on threatened species should be prioritized in CBA2 areas.

Protection

- CBA2s may be the focus of stewardship agreements aimed at the protection of threatened species.

- CBA2s should be appropriately zoned to avoid conversion from agriculture.

Rehabilitation

- Rehabilitation work should only be undertaken if it does not negatively impact on the identified threatened species dependent on the agricultural landscape.

Development Guidelines

Where infrastructure is proposed, the following guidelines should be implemented -

- Rezoning of properties to afford additional land-use rights that will result in increased biodiversity loss through conversion of land from agriculture should not be granted;
- Permission to increase the permitted number of units per erf or per ha should not be granted;
- Infrastructure developments should be limited to existing footprints, if present, and should avoid encroaching on natural or agricultural landscapes;
- Should additional infrastructure be required, the requirements of threatened species should be taken into account. At least a Basic Assessment should be undertaken for any development which results in the intensification of land-use, and if intensification of land-use is approved, a comprehensive EMP or must be developed to minimize impacts on threatened species;
- Ecological Specialist to conduct the ecological assessment;
- A Construction & Operational Environmental Management Plan should be compiled and implemented.

Where development proposals other than the preferred biodiversity-compatible land-uses (see table above are submitted in terms of the NEMA: EIA regulations or Land-Use Planning Ordinance (LUPO):

- A Screening Exercise should be undertaken by a Biodiversity Specialist or Ecologist to verify the CBA map category on site;
- If the site is verified as a CBA2, developments which result in the intensification of land-use or the conversion of agricultural land should be identified as a 'Fatal Flaw';
- If the application is pursued they should be informed by a specialist biodiversity assessment.

Aquatic Ecosystems

- Maintain water quality and flow regimes should be maintained as close to natural as possible;
- Where Environmental Reserves or Environmental Flow Requirements have been determined these should be strictly adhered to;
- All effluent (including municipal, mining and industrial waste water) as well as acid mine drainage should be treated to required specifications before release;
- Stormwater flow should be managed to avoid damage to CBA2 areas.
- Where CBA2s include floodplains (e.g. areas within the 1:100 year floodline), riparian areas (e.g. as a minimum, the 32m around rivers) or buffers around wetlands, particular attention should be applied to ensure that these remain in a natural state or are rehabilitated to this state in order to maintain suitability for threatened species dependent on these habitats. In addition to avoiding intensification of land-use, other activities such as livestock access to wetlands may need to be controlled to avoid impacts on threatened species. Do not permit infilling, excavation, drainage, hardened surfaces (including buildings and asphalt), intensive agriculture or any new infrastructure developments within a river or wetland.
- Areas that are degraded or disturbed should be rehabilitated, through programmes such as Working for Water, Working for Wetlands and a systematic invasive alien vegetation

eradication programme implemented. Rehabilitation work should be undertaken in a way which does not negatively impact on the survival of threatened species.

ECOLOGICAL SUPPORT AREAS ONE

Maintain in a FUNCTIONAL STATE

General Recommendations

- Maintain in a functional state, avoid intensification of land-uses, and rehabilitate to a natural or semi-natural state where possible. In transformed areas which are important for maintaining ecological processes, current land-uses should be maintained, intensification of use (e.g. a transition from agriculture to urban) should be avoided, and where possible areas should be rehabilitated.
- No further loss of natural habitat should be allowed, and land in this category currently in a degraded state should be rehabilitated or restored to a natural or semi-natural state once the current land-use has ceased;
- Maintain current land-uses where these play a role in supporting ecological processes;
- Ensure land-use changes do not impact negatively on ecological processes.
- The maintenance of connectivity between CBAs, continued ecosystem functioning within the CBA corridors, and the prevention of degradation of adjacent Critical Biodiversity Areas must be achieved;
- After the CBA1s, ESA1s should be prioritised for land care projects, Working for Water (WfW) and NGOs to direct their conservation projects, programmes and activities;
- An Ecological Management Plan should be compiled where required for ESAs. EMP to include invasive alien plant control, fire management etc.

Development Guidelines

Where infrastructure is proposed, the following guidelines should be implemented -

- Rezoning of properties to afford additional land-use rights that will result in increased impact on ecological processes should not be granted, unless significant net conservation gains can be achieved, ecosystem functioning and connectivity of Ecosystem Support Areas (ESAs) will not be compromised, and biodiversity impacts with regard to species and ecosystems are of an acceptable level and mitigated where possible;
- Infrastructure developments should be limited to existing developed / degraded footprints, where possible;
- Units carefully dispersed or clumped to achieve least impact, particularly with regard to impacts on ecological processes;
- Ecological Specialist to conduct the ecological assessment;
- A Construction & Operational Environmental Management Plan to be compiled and implemented.

Where development proposals other than the preferred biodiversity-compatible land-uses are submitted in terms of the NEMA: EIA regulations or Land-use Planning Ordinance (LUPO) for areas which remain intact:

- A Screening Exercise should be undertaken by a Biodiversity Specialist or Ecologist to verify the CBA map category on site;
- If the site is verified as an ESA, developments other than the preferred biodiversity-compatible land-uses should be carefully screened to ensure that developments are planned and activities undertaken in a way that minimizes impact on ecological processes. Impacts should be mitigated.
- If the application is pursued they should be informed by a specialist biodiversity assessment.

In transformed areas which are still important for supporting ecological processes, the following guidelines should be implemented -

- Current land-uses should be maintained, intensification of use (e.g. a transition from extensive agriculture to urban) should be avoided, and where possible areas should be rehabilitated;
- Land-use changes should be screened to ensure that they do not have an unacceptable impact on ecological processes.

Aquatic Ecosystems

- Water quality and flow regimes should be maintained as close to natural as possible;
- Where Environmental Reserves or Environmental Flow Requirements have been determined these should be strictly adhered to;
- All effluent (including municipal, mining and industrial waste water) as well as acid mine drainage should be treated to required specifications before release;
- Stormwater flow should be managed to avoid damage to ESA areas;
- Where ESAs include floodplains (e.g. areas within the 1:100 year floodline), riparian areas (e.g. as a minimum, the 32m around rivers) or buffers around wetlands, particular attention should be applied to ensure that these remain in a natural state or are rehabilitated to this state. In addition to avoiding habitat loss or degradation, other activities such as livestock access may need to be controlled and invasive alien vegetation managed to avoid damage to banks. Do not permit infilling, excavation, drainage, hardened surfaces (including buildings), intensive agriculture or any new infrastructure developments within a river or wetland.
- Areas that are degraded or disturbed should be rehabilitated, through programmes such as Working for Water, Working for Wetlands and a systematic invasive alien vegetation eradication programme implemented.
- Creation of berms, roads, culverts, canalisation, channelisation, invasive alien vegetation, impoundment, abstraction, well points, storm-water or other point source inflows, irrigation return flows, grazing / trampling, agriculture, golf courses, suburban gardens, artificial deepening, and drainage, should be avoided where possible within the 1:20 year floodline.

ECOLOGICAL SUPPORT AREAS TWO

Maintain and restore ECOLOGICAL FUNCTIONING where possible

General Recommendations

- Additional impacts on ecological processes should be avoided. In transformed areas which are important for maintaining ecological processes, current land-uses should be maintained, intensification of use (e.g. a transition from agriculture to urban) should be avoided, and where possible areas should be rehabilitated.

- The maintenance of connectivity between CBAs, continued ecosystem functioning within the CBA corridors, and the prevention of degradation of adjacent Critical Biodiversity Areas must be achieved;
- In some cases the rehabilitation of ESA2s may be the suitable for land care projects, Working for Water (WfW) and NGOs to direct their conservation projects, programmes and activities;

Development Guidelines

Where infrastructure is proposed, the following guidelines should be implemented -

- Infrastructure should be designed to avoid additional impacts on ecological processes.

In transformed areas which are still important for supporting ecological processes, the following guidelines should be implemented -

- Current land-uses should be maintained, intensification of use (e.g. a transition from agriculture to urban) should be avoided, and where possible areas should be rehabilitated;
- Infrastructural developments should be screened to ensure that they do not have an unacceptable impact on ecological processes.

Aquatic Ecosystems

- Water quality and flow regimes should be maintained as close to natural as possible;
- Where Environmental Reserves or Environmental Flow Requirements have been determined these should be strictly adhered to;
- All effluent (including municipal, mining and industrial waste water) as well as acid mine drainage should be treated to required specifications before release;
- Stormwater flow should be managed to avoid damage to ESA2 areas;
- Where ESA2s include floodplains (e.g. areas within the 1:100 year floodline), riparian areas (e.g. as a minimum, the 32m around rivers) or buffers around wetlands, particular attention should be applied to ensure that there is no additional impact on ecological functioning, and where possible these areas rehabilitated to improve ecological functioning. In addition to avoiding intensification of land-use, other activities such as livestock access may need to be controlled and invasive alien vegetation managed to avoid damage to banks. Do not permit infilling, excavation, drainage, hardened surfaces (including buildings), intensive agriculture or any new infrastructural developments within a river or wetland.
- Creation of berms, roads, culverts, canalisation, channelisation, invasive alien vegetation, impoundment, abstraction, well points, storm-water or other point source inflows, irrigation return flows, grazing / trampling, agriculture, golf courses, suburban gardens, artificial deepening, and drainage, should be avoided where possible within the 1:20 year floodline.

5 Part F: Monitoring, Reviewing and Updating

The Ekurhuleni Metro is the developer and primary implementing agent of the Bioregional Plan, and is, therefore, responsible for the monitoring, reviewing and updating of this plan. The systematic biodiversity plan underpinning the Bioregional Plan is the responsibility of the Gauteng Department of Agriculture and Rural Development (GDARD).

As the Bioregional Plan was developed in parallel to similar bioregional plans in the Gauteng Province, it is dependent on the same underlying systematic biodiversity plan, and, as there are numerous issues requiring joint planning (e.g. shared catchments), it would be efficient to establish an inter-agency structure for coordinating the implementation, monitoring, reviewing and updating of the bioregional plans. Alternatively, these activities would need to be undertaken independently by the Ekurhuleni Metro.

- The establishment of an appropriate inter-agency structure to coordinate the implementation, monitoring, reviewing and updating of the bioregional plan.
- The ongoing evaluation of its use in land-use planning and decision-making.
- The review of, and if necessary revision of the underlying systematic biodiversity plan at least every five years.
- The update of the published bioregional plan at least every five years.

5.1 Monitoring

To ensure compliance with the Biodiversity Act and the Guideline for Bioregional Plans, formal monitoring of the implementation of the Bioregional Plan must be undertaken on at least a five-yearly cycle to ensure appropriate revision of the Bioregional Plan. However, as the successful implementation of the Bioregional Plan is dependent on a variety of measures, and requires the cooperation of a number of different departments and agencies, it is recommended that a bi-annual or annual monitoring and reporting program is established immediately on the gazetting of the Bioregional Plan. It is recommended that a Gauteng Bioregional Plan Coordination Committee (or an equivalent structure) is convened with representation of Ekurhuleni Metro and other municipalities with bioregional plans in Gauteng, and the Gauteng Department of Agriculture and Rural Development (GDARD). The task of the committee would be to ensure the effective implementation of the bioregional plans, to undertake the ongoing monitoring of the implementation of the plans, and to ensure the review and update the bioregional plans when necessary. Gathering of data on the monitoring indicators should become a normal function of the planning departments within each of the municipalities. The outcomes of the monitoring programmes should be used as key indicators for the biodiversity and planning departments within the Ekurhuleni Metro and other municipalities with bioregional plans in Gauteng and the Gauteng Department of Agriculture and Rural Development (GDARD).

5.1.1 Monitoring indicators

- The primary purpose of the ongoing monitoring is to evaluate the ongoing implementation of the Bioregional Plan, rather than to evaluate the biodiversity outcomes of these actions or to describe the state of biodiversity within the Bioregion. Therefore, the following **implementation monitoring** indicators are proposed:
- Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that are contained within conservation orientated zones with Spatial Development Frameworks and Environmental Management Frameworks. For this purpose, conservation

orientated zones are defined as areas where the primary purpose is conservation or where there are significant restrictions on allowable land-uses.

- Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that are under some form of conservation management (including both formal protection and biodiversity stewardship agreements).
- Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas where subdivision has been approved or where increased development rights have been granted.
- Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas where appropriate biodiversity management interventions have been applied (e.g. clearing of invasive alien species).
- The advantage of these indicators is that they do not require investment into baseline biodiversity data gathering, but rather focus on the evaluation of the implementation mechanism. This should allow these indicators to be evaluated on at least an annual basis. However, it will be necessary to evaluate the biodiversity outcome of the implementation of the bioregional plan in order to conduct the required five-year review of the bioregional plan. Additional **biodiversity monitoring** indicators should include at least an evaluation of:
 - Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that have been severely modified due to various land-use changes.
 - Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that are in a natural or near-natural state (key aspects would be level of invasive alien vegetation infestation, level of degradation due to overgrazing or dumping etc).
 - Percentage (and area) of Critical Biodiversity Areas and Ecological Support Areas that have been rehabilitated to a satisfactory ecological condition.

5.2 Review

The bioregional plan must be reviewed and updated (where necessary) at least every five years. It is recommended that this is a function of the proposed Bioregional Plan Coordination Committee (or an equivalent structure) which should include representatives of the Ekurhuleni Metro and the other municipalities with bioregional plans in Gauteng, the Gauteng Department of Agriculture and Rural Development (GDARD). The review process should examine:

- Progress towards the full implementation of the bioregional plan (as measured by the implementation monitoring indicators from Section 5.1.1).
- The biodiversity outcome of the implementation actions (as measured by the biodiversity monitoring indicators from Section 5.1.1).
- The need (or lack thereof) for an update of the underlying systematic biodiversity plan. Although the update of a systematic biodiversity plan is a data intensive and time consuming process, it is likely that it will be necessary to update underlying systematic biodiversity plan for the province at least every five years.
- The need (or lack thereof) for an update of the other components of the bioregional plan (e.g. land-use guidelines; monitoring indicators and processes).

5.3 Updating

Should the bioregional plan review process (5.2) indicate that it is necessary to update the bioregional plan or components of the plan, then this should be undertaken, and the revised plan should be resubmitted to the MEC for approval. Ideally this should be timed to precede the revision cycle for municipal SDFs. Responsibility for the update lies with the Ekurhuleni Metro which is the developer and primary implementing agent of the bioregional plan. Importantly,

the underlying systematic biodiversity plan remains the responsibility of the Gauteng Department of Agriculture and Rural Development (GDARD).

6 Part G: GIS Files

Table 11. Geographic Information System (GIS) Data files

File name	Important fields	Description	Source
Gauteng_CBA_August_2011.shp	CBA_FIN= Critical Biodiversity Area Category; CBA1, CBA2, ESA1, ESA2., ONA, NNR	Critical Biodiversity Areas and Ecological Support Areas based on Gauteng C-Plan v3.3, modified for this Bioregion Plan: CBA cat. classes of interest [CBAFIN= CBA1, CBA2, ESA1, ESA2, NNR, ONA, PA]	GDARD 2013
G_CBA_0811 (GRID)	CBA_FIN, CPLAN33, LOOKUP33, LC5, DM	Integrated GRID data set (10m) with final CBA category (CBAFIN), LandCover (LC5), District (DM), CPLAN AREA (CPLAN33), Description of CBA (LOOKUP33).	GDARD 2013

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8 Glossary

Biodiversity: The diversity of genes, species and ecosystems on Earth, and the ecological and evolutionary processes that maintain this diversity.

Biodiversity stewardship: a model for expanding the protected area network in which conservation authorities enter into contract agreements with private and communal landowners to place land that is of high biodiversity value under formal protection. Different categories of agreement confer varying degrees of protection on the land and hold different benefits for landowners. The landowner retains title to the land, and the primary responsibility for management remains with the landowner, with technical advice and assistance provided by the conservation authority.

Biodiversity target: The minimum proportion of each ecosystem type that needs to be kept in a natural or near-natural state in the long term in order to maintain viable representative samples of all ecosystem types and the majority of species associated with those ecosystem types.

Biome: An ecological unit of wide extent, characterised by complexes of plant communities and associated animal communities and ecosystems, and determined mainly by climatic factors and soil types. A biome may extend over large, more or less continuous expanses or land surface, or may exist in small discontinuous patches.

Bioregional plan (published in terms of the Biodiversity Act): A map of Critical Biodiversity Areas and Ecological Support Areas, for a municipality or group of municipalities, accompanied by contextual information, land- and resource-use guidelines and supporting GIS data. The map must be produced using the principles and methods of systematic biodiversity planning, in accordance with the Guideline for Bioregional Plans.⁶ A bioregional plan represents the biodiversity sector's input into planning and decision-making in a range of other sectors. The development of the plan is usually led by the relevant provincial conservation authority or provincial environmental affairs department. A bioregional plan that has not yet been published in the Government Gazette in terms of the Biodiversity Act is referred to as a biodiversity sector plan.

Conservation area: 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. Because there is no long-term security associated with conservation areas, they are not considered a strong form of protection. Also see Protected area.

Critical Biodiversity Area: Areas required to meet biodiversity targets for ecosystems, species or ecological processes, as identified in a systematic biodiversity plan. May be terrestrial or aquatic.

Critically endangered ecosystem: an ecosystem type that has very little of its original extent (measured as area, length or volume) left in natural or near-natural condition. Most of the ecosystem type has been severely or moderately modified from its natural state. The ecosystem

⁶ Department of Environmental Affairs and Tourism. 2009. *Guideline regarding the determination of bioregions and the preparation and publication of bioregional plans*. Notice No. 291, Government Gazette No. 32006, 16 March 2009.

type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost.

Ecological Support Area: An area that is not essential for meeting biodiversity targets but plays an important role in supporting the ecological functioning of one or more Critical Biodiversity Areas or in delivering ecosystem services. May be terrestrial or aquatic.

Ecosystem protection level: Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as well protected, moderately protected, poorly protected, or not protected, based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Unprotected, poorly protected or moderately protected ecosystem types are collectively referred to as under-protected ecosystems.

Ecosystem services: the benefits that people obtain from ecosystems, including provisioning services (such as food and water), regulating services (such as flood control), cultural services (such as recreational benefits), and supporting services (such as nutrient cycling, carbon storage) that maintain the conditions for life on Earth. Ecosystem services are the flows of value to human society that result from a healthy stock of ecological infrastructure. If ecological infrastructure is degraded or lost, the flow of ecosystem services will diminish.

Ecosystem threat status: Indicator of how threatened ecosystems are, in other words the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function or composition. Ecosystem types are categorised as critically endangered, endangered, vulnerable or least threatened, based on the proportion of the original extent of each ecosystem type that remains in good ecological condition relative to a series of biodiversity thresholds. Critically endangered, endangered and vulnerable ecosystems are collectively referred to as threatened ecosystems, and may be listed as such in terms of the Biodiversity Act.

Ecosystem type: An ecosystem unit that has been identified and delineated as part of a hierarchical classification system, based on biotic and/or abiotic factors. Factors used to map and classify ecosystems differ in different environments. Ecosystem types can be defined as, for example, vegetation types, river ecosystem types, wetland ecosystem types, estuary ecosystem types, or marine or coastal habitat types. Ecosystems of the same type are likely to share broadly similar ecological characteristics and functioning. Also see National ecosystem classification system.

Endangered ecosystem: An ecosystem type that is close to becoming critically endangered.

Freshwater Ecosystem Priority Area: A river or wetland that is required to meet biodiversity targets for freshwater ecosystems.

Least threatened ecosystem: An ecosystem type that has experienced little or no loss of natural habitat or deterioration in condition

Protected area: An area of land or sea that is formally protected by law and managed mainly for biodiversity conservation. This is a narrower definition than the IUCN definition, which includes

areas that are not legally protected and that would be defined in South Africa as conservation areas rather than protected areas. Also see Conservation area.

Species of special concern: Species that have particular ecological, economic or cultural significance, including but not limited to threatened species

Systematic biodiversity planning: A scientific method for identifying geographic areas of biodiversity importance. It involves: mapping biodiversity features (such as ecosystems, species, spatial components of ecological processes); mapping a range of information related to these biodiversity features and their ecological condition; setting quantitative targets for biodiversity features; analysing the information using software linked to GIS; and developing maps that show spatial biodiversity priorities. The configuration of priority areas is designed to be spatially efficient (i.e. to meet biodiversity targets in the smallest area possible) and to avoid conflict with other land and water resource uses where possible.

Threatened ecosystem: An ecosystem 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 structure, function or composition. The Biodiversity Act allows the Minister of Environmental Affairs or a provincial MEC for Environmental Affairs to publish a list of threatened ecosystems. To date, threatened ecosystems have been listed only in the terrestrial environment. In cases where no list has yet been published by the Minister, such as for all aquatic ecosystems, the ecosystem threat status assessment in the NBA can be used as an interim list in planning and decision-making. Also see Ecosystem threat status.

Threatened species: A species that has been classified as Critically Endangered, Endangered or Vulnerable, based on a conservation assessment (Red List), using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.

Vulnerable ecosystem: An ecosystem type that still has the majority of its original extent (measured as area, length or volume) left in natural or near-natural condition, but has experienced some loss of habitat or deterioration in condition. The ecosystem type is likely to have lost some of its structure and functioning, and will be further compromised if it continues to lose natural habitat or deteriorate in condition.

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