BIODIVERSITY SECTOR PLAN FOR THE UTHUKELA DISTRICT MUNICIPALITY, KWAZULU-NATAL TECHNICAL REPORT

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EXECUTIVE SUMMARY

The Biodiversity Act introduced several legislated planning tools to assist with the management and conservation of South Africa's biological diversity. These include the declaration of "Bioregions" and the publication of "Bioregional Plans". Bioregional plans are usually an output of a systematic spatial conservation assessment of a region. They identify areas of conservation priority, and constraints and opportunities for implementation of the plan. The precursor to a Bioregional Plan is a Biodiversity Sector Plan (BSP), which is the official reference for biodiversity priorities to be taken into account in land-use planning and decision-making by all sectors within the District Municipality.

The consultant team was appointed to fulfil the requirements of a BSP for the uThukela District Municipality, as informed by SANBI, the Bioregional Guidelines (DEAT, 2007), current best practice, and the EKZNW Project Terms of Reference. The final product is a series of maps highlighting those areas that are critically important for biodiversity, with accompanying land-use and management guidelines that serve to guide decision-making and inform multi-sectoral planning.

The process involved extensive mapping of vegetation types and species data (where available), ecological processes, transformation and threats, and setting of biodiversity targets. This information was used to identify Critical Biodiversity Areas and Critical Ecological Support Areas. A Critical Biodiversity Area is considered to be an irreplaceable and highly significant, area that needs to be maintained in a natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. A Critical Biodiversity Area comprises the best choice of area for achieving biodiversity targets of the relevant biodiversity feature(s). Critical Ecological Support Areas are areas that are not essential for meeting biodiversity targets but which nevertheless play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. Area selection aimed to achieve all the biodiversity targets in the most efficient spatial configuration.

The uThukela District Municipality encompasses marked biophysical, altitudinal and climatic gradients (with climate change implications), is critical for national water security, and is strategically placed for ensuring connectivity for maintaining biodiversity at a provincial and national scale. These factors, combined with large scale transformation and land use threats, were significant determinants in area selection, the formulation of land use guidelines, and the identification of key focus areas for conservation action.

The District is 1 133 390 hectares in extent, of which 39.2% has been transformed and 9.4% is contained in protected areas. Conservation targets could mostly be met in the uThukela District Municipality but the remaining amount of natural asset offered few choices for meeting these targets, restricting opportunities for ensuring regional connectivity (both terrestrial and aquatic), particularly east-west linkages. Conservation targets for all identified biodiversity features were accommodated, with the exception of Income Sandy Grassland. The threat of further transformation in key focus areas is of particular concern. Whilst all Critical Biodiversity Areas and Critical Ecological Support Areas require conservation management, a number of key focus areas were identified as priority areas for immediate attention. Other key issues include the threat of development within the Babangibone Development Node, the need for a formal conservation land use in the Mnweni Corridor, threats to remaining East-West linkages, potential for payment for ecosystem services, protection of water resources, and targeted Protected Area Expansion.

The BSP should be updated annually, based on a monitoring programme, new information, and the most recent land cover data available. Reporting should coincide with the municipal Integrated Development Plan and Land Use Management System review cycle, comprising a minimum 5-year cycle.

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Abbreviations

BSP	Biodiversity Sector Plan
CBA	Critical Biodiversity Area
CESA	Critical Ecological Support Area
The District	The uThukela District Municipality
EIA	The National Environmental Management Act: Environmental Impact Assessment Regulations promulgated under section 24(5) of NEMA and published in Government Notice 385 in Government Gazette 28753 of 21 April 2006
EIP	Environmental Implementation Plan
EMF	Environmental Management Framework
EMP	Environmental Management Plan
DAP	Drakensberg Approaches Policy (Martin, 1990)
DEAT	The National Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Forestry
EKZNW	Ezemvelo KwaZulu-Natal Wildlife as defined in Act 9 of 1997 to be the KZN Nature Conservation Service
GIS	Geographic Information System
IDP	Integrated Development Plan developed in terms of the Municipal Systems Act
IUCN	World Conservation Union (as commonly referenced)
KZN	KwaZulu-Natal Province of the Republic of South Africa
The Minister	The Minister of Environmental Affairs and Tourism
MDTP	Maloti-Drakensberg Transfrontier Project (Lechmere-Oertel, R.G. & Benn, G.B. 2008)
NEMA	The National Environmental Management Act 107 of 1998
NGO	Non-governmental organisation
NSBA	The National Spatial Biodiversity Assessment (SANBI)
NBSAP	The National Biodiversity Strategy and Action Plan (DEAT)
SANBI	The South African National Biodiversity Institute
SCAP	Special Case Area Plan for the Drakensberg, as produced by the KZN Town & Regional Planning Commission
SEA	Strategic Environmental Assessment
SDF	Spatial Development Framework as required by the Municipal Systems Act for each municipality
UDPWHS	uKhahlamba Drakensberg Park World Heritage Site

Important concepts

What is biodiversity and why is it important

Biodiversity means the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems (as per the National Environmental Management: Biodiversity Act, No. 10 of 2004). The term biodiversity refers to genes, species (plants and animals), ecosystems, and landscapes, and the ecological and evolutionary processes that allow these elements of biodiversity to persist over time.

South Africa's biodiversity provides an important basis for economic growth and development, in obvious ways such as providing a basis for its fishing industry, rangelands that support commercial and subsistence farming, horticultural and agricultural industry based on indigenous species, the tourism industry, aspects of the film industry, and commercial and non-commercial medicinal applications of indigenous resources.

Keeping South Africa's biodiversity intact is also vital for ensuring ongoing provision of ecosystem services such as production clean water through good catchment management, prevention of erosion, carbon storage (to counteract global warming), and clean air. Loss of biodiversity puts aspects of our economy and quality of life at risk, and reduces the socio-economic options for future generations.

What are ecological processes and why is it important to conserve them

An ecosystem is a community of animals and plants interacting with one another and with their physical environment. Ecosystems include physical and chemical components, such as soils, water, and nutrients that support the organisms living within them.

Ecological processes are processes that play an essential part in maintaining ecosystem integrity. Ecological processes include the cycling of water, the cycling of nutrients, the flow of energy, and biodiversity (as an expression of the process of evolution); this is linked to climate, primary productivity, carbon sequestration, hydrological processes, biophysical habitats, interactions between organisms, movements of organisms, and natural disturbance regimes.

The single biggest cause of biodiversity loss is loss or degradation of natural habitat and ecosystems. A common approach for conserving biodiversity is to develop priorities based on protecting natural 'assets', such as threatened species or depleted ecosystems. This essential approach has a major limitation: asset protection alone cannot conserve biodiversity unless the ecological processes that sustain assets are also maintained. This highlights the essential role of ecological processes in sustaining biodiversity. Key actions to achieve this goal comprise prioritizing preservation and restoration activities to strengthen ecological processes across landscape scales. Conservation strategies that are explicitly directed toward maintaining the integrity of ecological processes have greater potential to sustain biodiversity and evolutionary processes in the long-term.

What are ecosystem services and why are they important

An ecosystem means a dynamic complex of animal, plant and micro-organism communities and their non-living environment interacting as a functional unit (as per National Environmental Management: Protected Areas Act, No. 57 of 2003). Ecosystems include the interactions among all organisms in a given habitat. Ecosystem services are defined in Section 1 of the National Environmental Management: Protected Areas Act No. 57 of 2003 as "environmental goods and services" meaning:

a) benefits obtained from ecosystems such as food, fuel and fibre and genetic resources;
b) benefits from the regulation of ecosystem processes such as climate regulation, disease and flood control and detoxification; and
c) cultural non-material benefits obtained from ecosystems such as benefits of a spiritual, recreational, aesthetic, inspirational, educational, community and symbolic nature;".

Sustainable water production is also specifically included under this definition in the context of this study. Ecosystem Services are the processes by which the environment / ecosystem produces resources that we often take for granted such as clean water, timber, and habitat for fisheries, and pollination of native and agricultural plants. Ecosystems provide *inter alia* "services"
that:

- moderate weather extremes and their impacts
- disperse seeds
- mitigate drought and floods
- protect people from the sun's harmful ultraviolet rays
- cycle and move nutrients
- protect stream and river channels and coastal shores from erosion
- detoxify and decompose wastes
- control agricultural pests
- maintain biodiversity
- generate and preserve soils and renew their fertility
- contribute to climate stability
- maintenance of air quality
- purify the air and water
- regulate disease carrying organisms
- fuel and energy
- fodder and fertiliser
- medicinal resources
- pollinate crops and natural vegetation
- enjoyment of scenery
- education

The persistence of biodiversity, as well as health and wellbeing of human populations, depends upon the services provided by ecosystems and their components.

1. INTRODUCTION AND BACKGROUND

The KwaZulu-Natal Nature Conservation Board, trading as Ezemvelo KZN Wildlife, is the Nature Conservation Agency in the province of KwaZulu-Natal. Its core disciplines are biodiversity conservation, wise and sustainable use of natural resources, the creation and management of partnerships with stakeholders and communities and the provision of affordable eco-tourism destinations within the Province (Ezemvelo KZN Wildlife, 2008).

The National Environmental Management Biodiversity Act (2004) introduced several planning tools to assist Ezemvelo KZN Wildlife to give effect to their core mandate. This includes the development of bioregional plans that aim to:

- Achieve integrated and coordinated biodiversity planning;
- Provide for monitoring of the conservation status of various components of biodiversity; and
- Promote biodiversity research

A Bioregional Plan must be informed by a local 'biodiversity profile' or a BSP. The latter will enable Ezemvelo KZN Wildlife to comply with the legal prescripts of the Biodiversity Act and in so doing achieve their core mandate. The consultant team was appointed to fulfil the requirements of a BSP for the uThukela District Municipality, as informed by SANBI, the Bioregional Guidelines (DEAT, 2007), current best practice, and the EKZNW Project Terms of Reference, as follows:

1. Provide a biophysical description of the uThukela District Municipality.
2. Provide a spatial plan showing terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning, comprising an integration of the following GIS Layers:

    (a) National, Provincial and Municipal Protected Areas – appropriately buffered.
    (b) Areas which are critical for the continued provision of ecosystem services – examples are:
        a. areas that are the primary water production areas;
        b. wetlands – appropriately buffered; and
        c. rivers and riparian zones – appropriately buffered
    (c) Macro ecological corridors – broad- and fine-scale ecological corridors critical

for maintaining ecological connectivity at the local, landscape and provincial level.

(d) Indigenous Forests – appropriately buffered – protected under the Forest Act.

(e) Mandatory and Negotiated Reserves – from the most up to date aquatic and terrestrial systematic conservation plan for the region.

(f) Threatened Vegetation Types – highlight vulnerable, endangered and critically endangered vegetation types

(g) 2005 Land cover and current aerial imagery – update transformation layer if required by subtraction.

(h) Capture local knowledge from expert input - Locally gleaned fine scale information and priorities include untransformed land, species locations, wetlands, cultural, scenic etc

(i) Fine scale ecological corridors – capture local level process and connectivity with expert input.

(j) Threats Layer - Prioritise using primary landscape level threats for the area.

3. The final product is a series of maps highlighting those areas that are critically important for biodiversity, with accompanying land-use and management guidelines. A risk-averse approach was adopted, which takes into account the limits of current knowledge about the consequences of decisions and actions.

2. PURPOSE AND OBJECTIVES OF THE BIODIVERSITY SECTOR PLAN

The purpose of the plan is to:

- serve as an information layer for multi-sectoral planning and decision-making processes, specifically at the local scale for integration into local level planning (e.g.IDPs, SDFs, EMFs and EIAs);
- provide a proactive tool for guiding relevant stakeholders, in particular EKZNW staff at a regional level (specifically District Conservation Officers and Community Conservation Officers), as to where to focus biodiversity management programmes, plans and projects;
- provide land use and management guidelines for key stakeholders; and
- offer a platform from which further work can be initiated

The objectives of the plan are to:

- Ensure aquatic and terrestrial biodiversity targets are met at the District level;
- Conserve representative samples of biodiversity pattern;

- Conserve the ecological and evolutionary processes that allow biodiversity to persist over time; and
- Serve as a first step towards the development of a Bioregional Plan

3. POLICY LEGAL FRAMEWORK

The National Biodiversity Framework (in terms of Section 39 of the Biodiversity Act) and the Biodiversity Act seeks (amongst other things) to provide for the management and conservation of biological diversity within South Africa and of the components of biological diversity. To do this the Biodiversity Act introduced several legislated planning tools to assist with the management and conservation of South Africa's biological diversity. These include the declaration of "Bioregions" and the publication of "Bioregional Plans". Bioregional plans are usually the outputs of a systematic spatial conservation assessment of a region, identifying areas of conservation priority, and constraints and opportunities for their implementation. The precursor to a Bioregional Plan is a BSP.

The BSP demarcates critical biodiversity features within the administrative boundary of the uThukela District Municipality. A key objective of the BSP is to allow for its integration into a Bioregional Plan, which must be aligned with administrative boundaries; hence the development of the BSP at the District level.

The policy and legal context for the management and conservation of biological diversity in South Africa is provided in Figure 1 below. It serves to highlight that the development of the uThukela BSP in this project is ultimately nested in a formal institutional arrangement comprising of international, national, provincial and local obligations, commitments and targets. Ezemvelo KZN Wildlife is obliged to implement their mandate within this arrangement. Their provincial-specific Biodiversity Spatial Planning Programme (Figure 2) has taken cognizance of these requirements and how the biodiversity planning tools should be aligned with other sectoral planning tools.

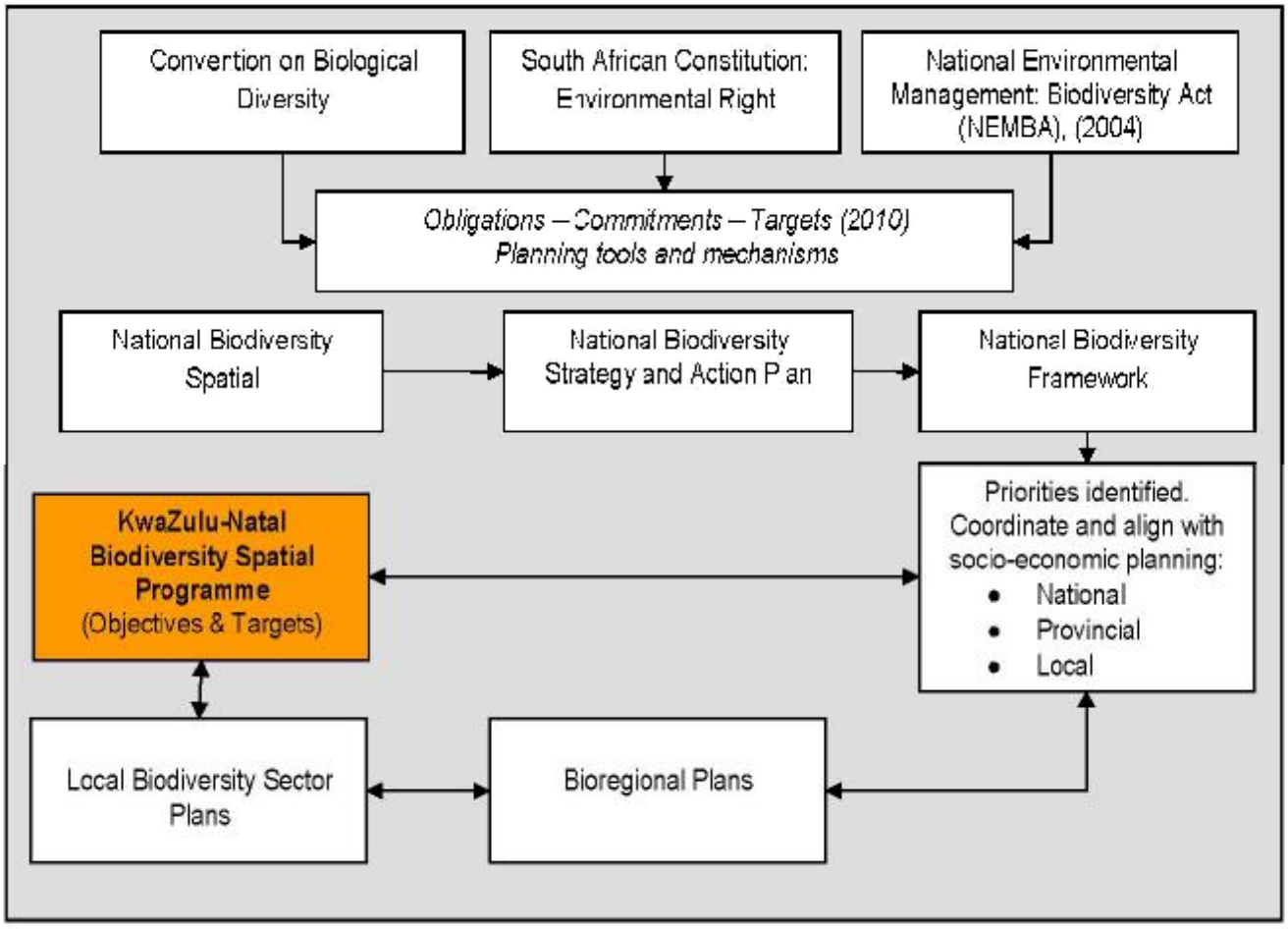


Figure 1 Broad Policy Context for Spatial Biodiversity Assessment and Planning

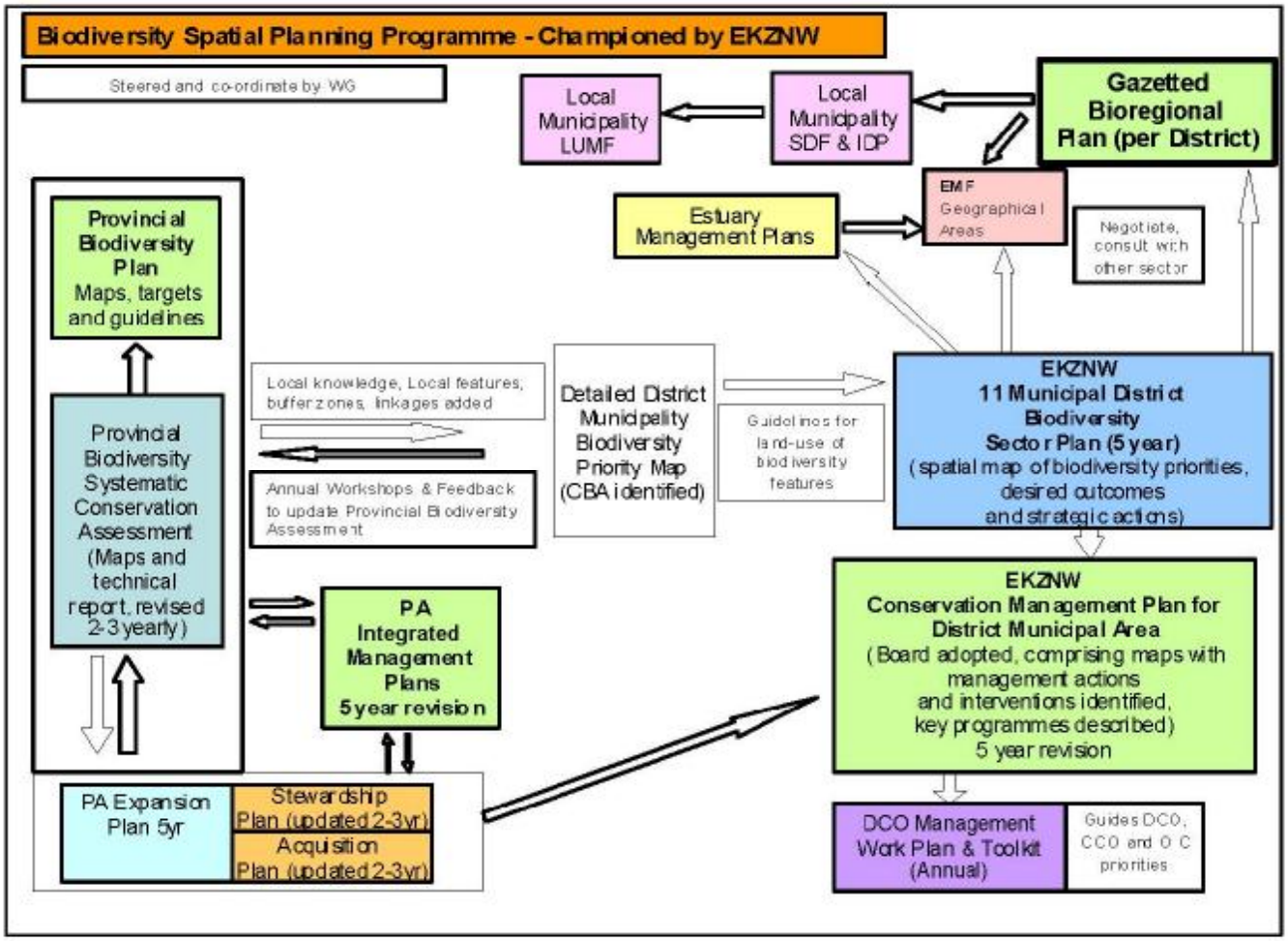


Figure 2 The KwaZulu-Natal Spatial Biodiversity Programme (Source: Dr P Goodman,

The KwaZulu-Natal Spatial Biodiversity Programme highlights the following important institutional aspects:

- Biodiversity assessment and planning follows a highly technical and scientific process that provides objective and quantifiable information.
- Local-level biodiversity plans inform and refine the Provincial Biodiversity Plan, improving its scientific basis.
- District BSPs will ultimately inform all other sector planning instruments and processes, but are equally important for directing the organisation's own management priorities (e.g. inform District Conservation Operational Plan and the Stewardship Plan).

The BSP supports the principles of integrated development planning and sustainable development, in that it should guide natural resource management and feed into multisectoral planning and assessment processes such as EIPs, EMPs, EMFs, SDFs, IDPs, SEAs, EIAs, and Bioregional Plans. The plan is the official reference for biodiversity priorities to be taken into account in land-use planning and decision-making by all sectors within the uThukela District Municipality, and should be read in conjunction with other guidelines and biodiversity planning tools that have been produced for the municipality.

In general bioregions and bioregional plans should be aimed at the conservation and management of South Africa's biodiversity. However, it is recognised that ecosystems and geographical features do not always respect international boundaries. As such Section 40(5) of the Biodiversity Act empowers the Minister to enter into an agreement with a neighbouring country to secure the effective implementation of a bioregional plan. It did not prove necessary to consider neighbouring Lesotho in this planning exercise owing to existence of the MDTP.

The BSP complies with NEMA principles in terms of sustainability, in seeking to prevent (i) disturbance of important ecosystems, (ii) loss of biological diversity, pollution and degradation of the environment, (iii) disturbance of landscapes and sites that constitute the nation's cultural heritage, (iv) the irresponsible and inequitable use and exploitation of nonrenewable natural resources, and (v) the development, use and exploitation of renewable resources and the ecosystems to a level beyond which their integrity is jeopardised.

Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option. The BSP focuses primarily on the biophysical environment; social and economic aspects would be more comprehensively integrated in the development of a Bioregional Plan, which would include the necessary consultation.

4. BIOPHYSICAL PROFILE OF THE DISTRICT

4.1 Biophysical Gradient

The uThukela District Municipality comprises a marked biophysical gradient and diversity of habitat types that is determined by altitude, slope position, aspect, climate, topography and geology, which translates into exceptional terrestrial and aquatic biodiversity, species richness and endemicity. Figure 3 illustrates the diversity of relief.

Conservation planning must therefore incorporate the range of biophysical factors in order to retain this high biodiversity. The Drakensberg is the highest lying component of the planning domain, comprising three altitudinal zones extending from approximately 1300m to 3500m above sea level (the Montane zone, the Sub-Alpine zone, and the Alpine Zone), which encompasses the steepest altitudinal gradient in the District. A marked altitudinal gradient also extends across the rest of the District (600m to 1300m), resulting in a variety of habitat types and species distributions not catered for within the MDTP. The landscape varies from gentle undulating hills through to a rolling and partly broken landscape, rocky rugged slopes and terraces, mountainous areas much incised by river gorges, narrow and broad valleys, plateaus with steep slopes, steep valleys and escarpment slopes, high mountain ridges separated by deep valleys, major cliff faces, complex mountain topography, and steep basalt rock faces and terraces. Topographical variation includes diversity of aspect associated with the valleys and ridgelines crossing the District, in places providing localised climate variability in cooler sheltered areas, offering fire refugia and suitable habitat for forests (subridge scarps and moist sheltered kloofs).

Geologically the District comprises extraordinary variation over a diverse landscape (Figure 4). A variety of Karoo Supergroup rocks occur in the area, including Stormberg basalts, Dwyka tillites, Ecca, Stormberg and Beaufort Groups. Geological formations are sedimentary or igneous in origin, including sandstone, shale, mudstone, dolerite, quartzite, dolomite, granite, diabase, and basalt. Geological exposure is confounded with altitude, especially for the well layered Karoo supergroup. Soil forms are therefore highly varied in terms of depth, drainage, fertility, clay and sand content, and include *inter alia* alluvial, duplex, vertisols and solodised solonetzic, fersiallitic, calcareous, and mollisol soils (Figure 5).

Varying climatic conditions prevail across the District, as illustrated by varying Mean Annual Precipitation (Figure 6). With the exception of some precipitation in the west from cold fronts in winter, the region is subject to summer rainfall with dry winters. However, dry summers and summer droughts are also frequent, particularly in the east. Mean Annual Precipitation (MAP) ranges from 576mm to 1923mm in the District, with large scale variations over relatively short distances. Whilst rainfall in form of thunderstorms is the prevalent form of precipitation, a common feature in the District, hail, fog and snow are common in the wetter, colder parts of the District, especially at higher elevations. Frost, snow and mist are totally absent in some areas, whilst light, moderate and severe occurrences are common in other areas at varying frequencies, from infrequent to up to probably more than half the year, including occasionally in summer. Summers are warm to hot, to extremely hot, and winters are mild to cold, to extremely cold. Mean Annual Temperature ranges from approximately 4oC to 17°C, with mean monthly maximum and minimum temperatures ranging by up to 42.5°C for December and June in parts, highlighting significant temperature differences between summer and winter. Mean annual evaporation varies considerably in the District depending on the relationship of rainfall and temperature, and is recorded as high as 11923mm.

Climate change scenarios predict major changes in biome distribution in South Africa. Individual species and ecosystems will respond differently to climate change, some potentially increasing in abundance or range, others declining or contracting. Ecosystems will experience changes in their species mix, and these changes may increase their vulnerability to further change or to climate extremes. Models indicate that climate change impacts will largely consist of latitudinal and altitudinal shifts in potential species' distributions while others suggest that the complete disappearance of critical climate types and dependent species are possible. Climate change will affect not only the survivorship of particular species, but also fragment the landscape and affect the natural resources that species have adapted to use in their natural environment. Species are thus marginalised and forced to move elsewhere to find places to live and food to eat. The impact of climate change will therefore increase the risk of species extinction and impact on biodiversity integrity. On a provincial scale, the biophysical gradient is more pronounced in the uThukela District Municipality as compared to all other municipalities in KwaZulu-Natal, which highlights the critical role that this municipality is likely to perform in biodiversity conservation in response to climate change. The NSBA also concluded that this District includes areas of biome resilience, where the current biome may persist in the face of climate change, under different climate change scenarios.

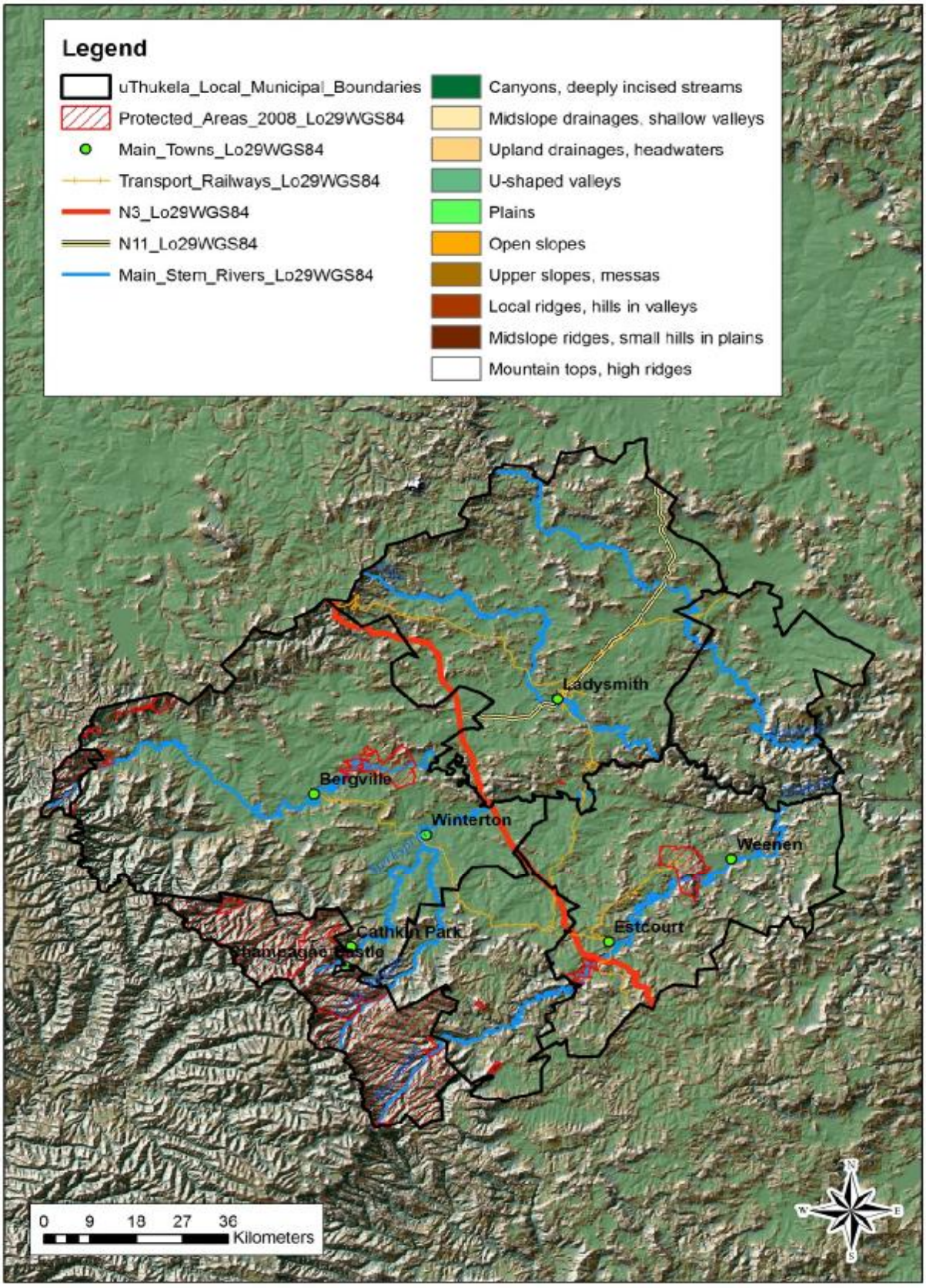


Figure 3: Digital Elevation Model of the District

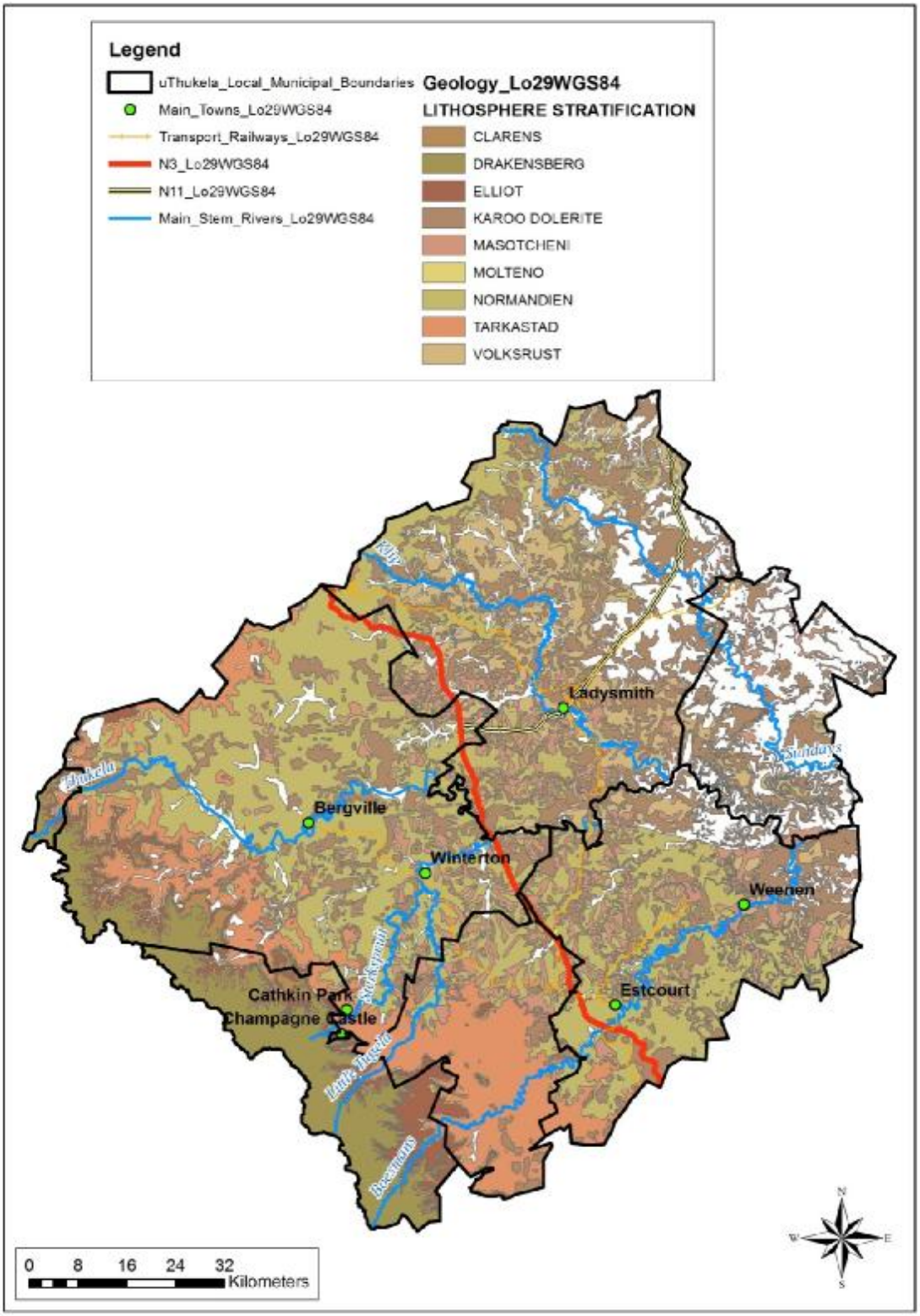


Figure 4: Geological Series Map of the District

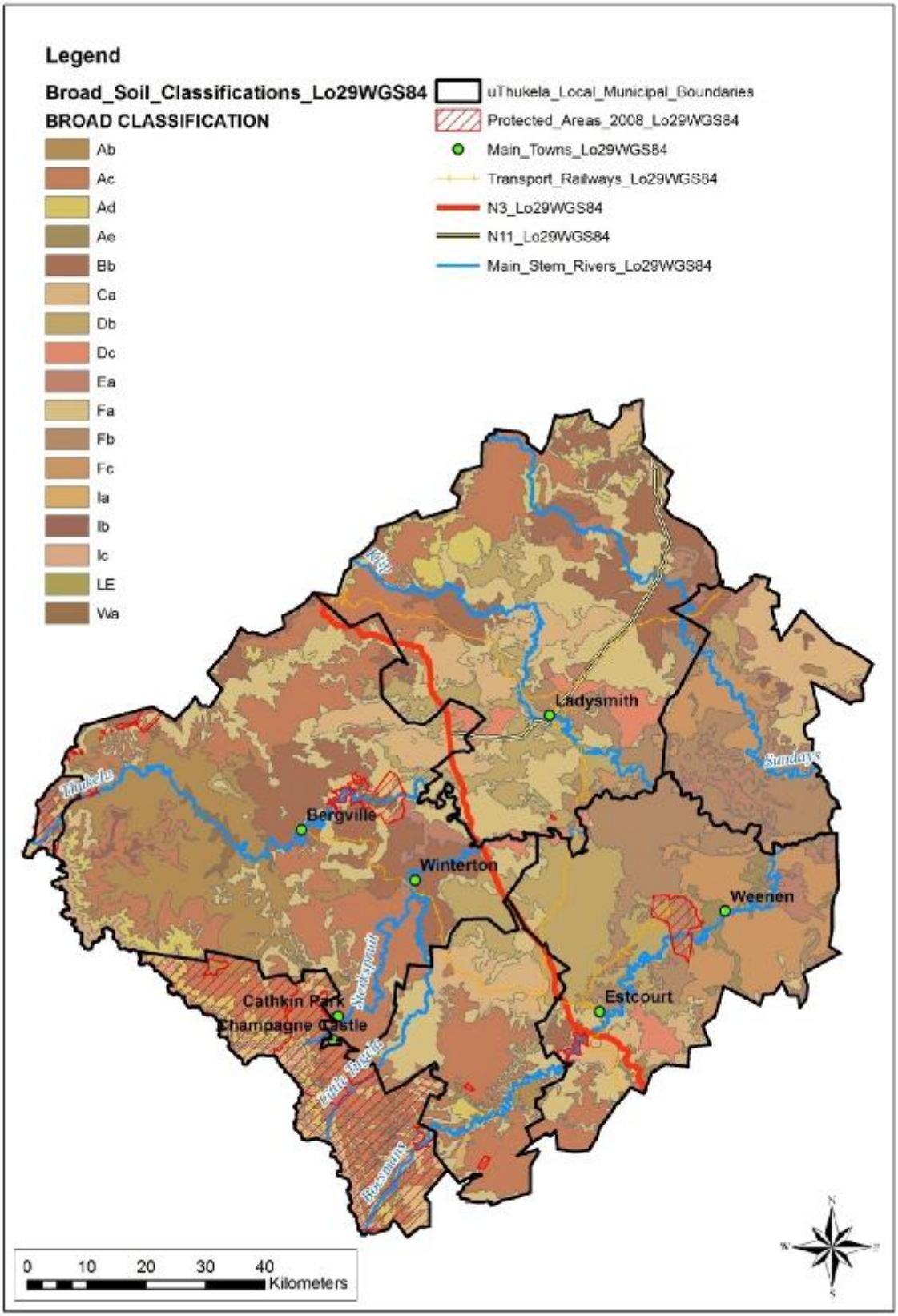


Figure 5 Broad Soil Classification Map of the District

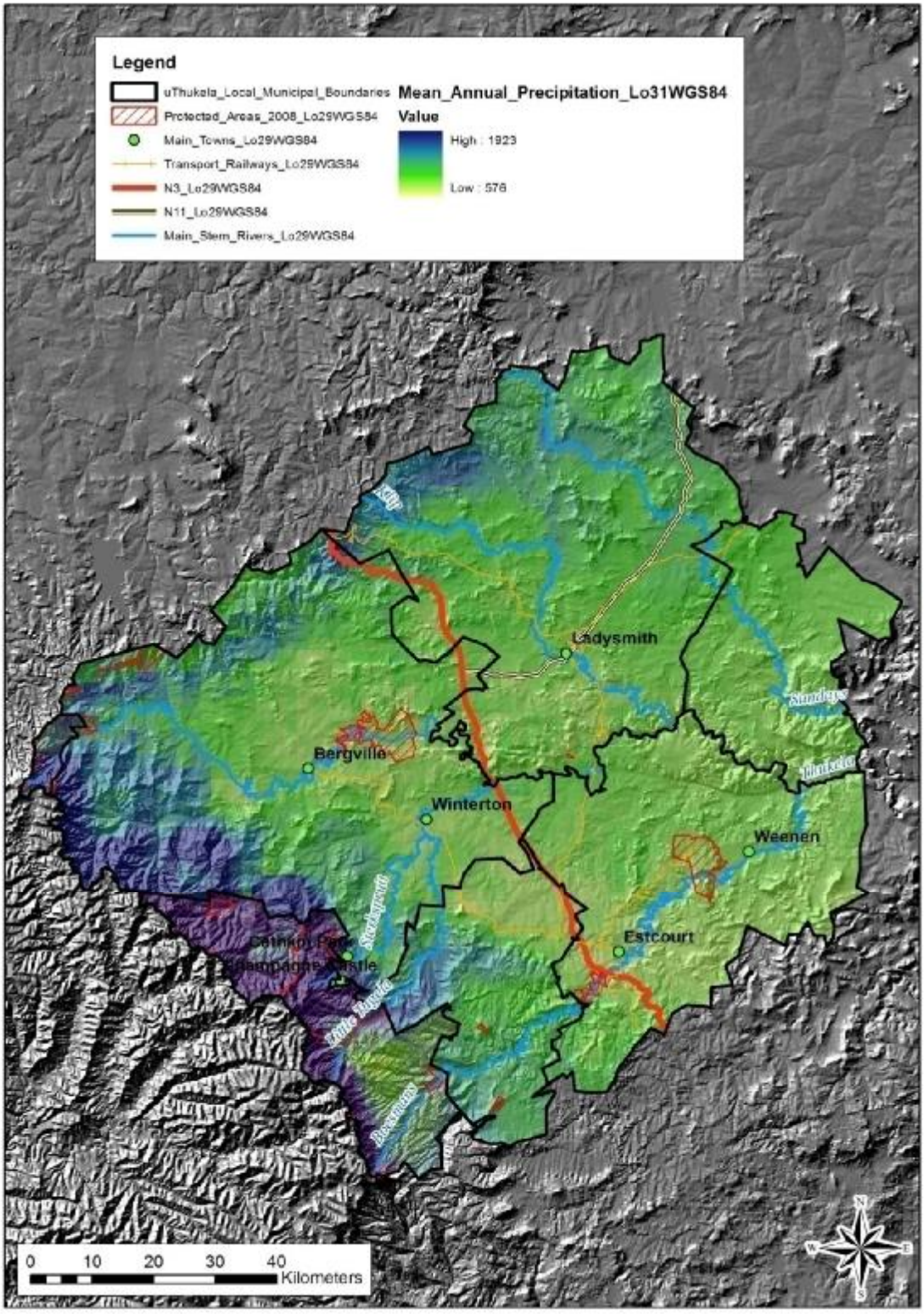


Figure: 6 Mean Annual Precipitation Map of the District

4.2 Vegetation, Plant and Animal Species

The District has exceptional heterogeneity in habitat, which translates into rich vegetation diversity, as described in Mucina & Rutherford (2006), comprising lower altitude dense bushveld, savanna and grasslands, extending up to high altitude montane and alpine grasslands, including significant pockets of indigenous forests. The only Afro-alpine vegetation in southern Africa is shared between Lesotho, the Eastern Cape and Natal. The District comprises predominantly endangered and vulnerable vegetation types, and contains exceptionally rich floral and faunal species diversity. At least 180 and 61 Red Data plant and animal species are found within the District, respectively. Conservation International recognises the area as an Eastern AfroMontane biodiversity hotspot, while Birdlife International sees the Southern African Grasslands (including those in the District) as two endemic bird areas (www.birdlife.org). In addition to this the majority of the area above 1800m has been documented as the Drakensberg Alpine Centre of plant endemism (Cowling & Hilton-Taylor, 1994, Carbutt & Edwards, 2004). Of the 2520 flowering plant species, three hundred and thirty four (13%) are locally endemic to the area, with a further five hundred and ninety four (23%) being near-endemic.

Half of the 18 vegetation types in the municipality are classified as Endangered or Vulnerable, respectively comprising 20.5% and 61.4% of the District's land surface area (Figure 7). The uThukela District Municipality therefore contains a disproportionately large percentage of area classified Endangered and Vulnerable (81.9%). The demarcation and appropriate management of the best parcels of land within the uThukela District Municipality is therefore critically important for the conservation of these vegetation types in KZN.
Appendix 1 provides a summary of the different vegetation types within the municipality.

Landscape heterogeneity, coupled with a significant Protected Area Network (Section 4.5) and reasonably intact vegetation across the municipality, offers a high diversity of habitats which support a large proportion of important faunal and floral species. The majority of Red Data plant species predominantly occur in the higher altitudinal areas of the Drakensberg, which is to the greatest extent protected (with exception of the Mnweni Valley). The Drakensberg Alpine Region is considered a centre of plant diversity and endemism. A total of 2153 species of plants have been recorded for the UDPWHS with an endemism percentage of 29.5%, and 109 listed threatened species per Red Data List category. A large proportion of these species are found within the District. A number of

protected species in terms of the KwaZulu-Natal Conservation Ordinance and other Red Data species also occur outside of the Drakensberg Alpine Region (Appendix 2).

Most of the these species are well conserved within existing Protected Areas, however, four priority species were identified, namely *Barleria greenii*, *Barleria argillicola*, *Hemizigia bulosii* and *Calpurnia woodii*, which are considered very rare and are not within Protected Areas. The District is especially important for the conservation of these priority species as they are almost exclusively found within this District. The exception is *Hemizigia bulosii*, which is also found east of Barberton. *Crocosmia pearsei* and *Protea nubigena* are also restricted to the District, but are located within Protected Areas.

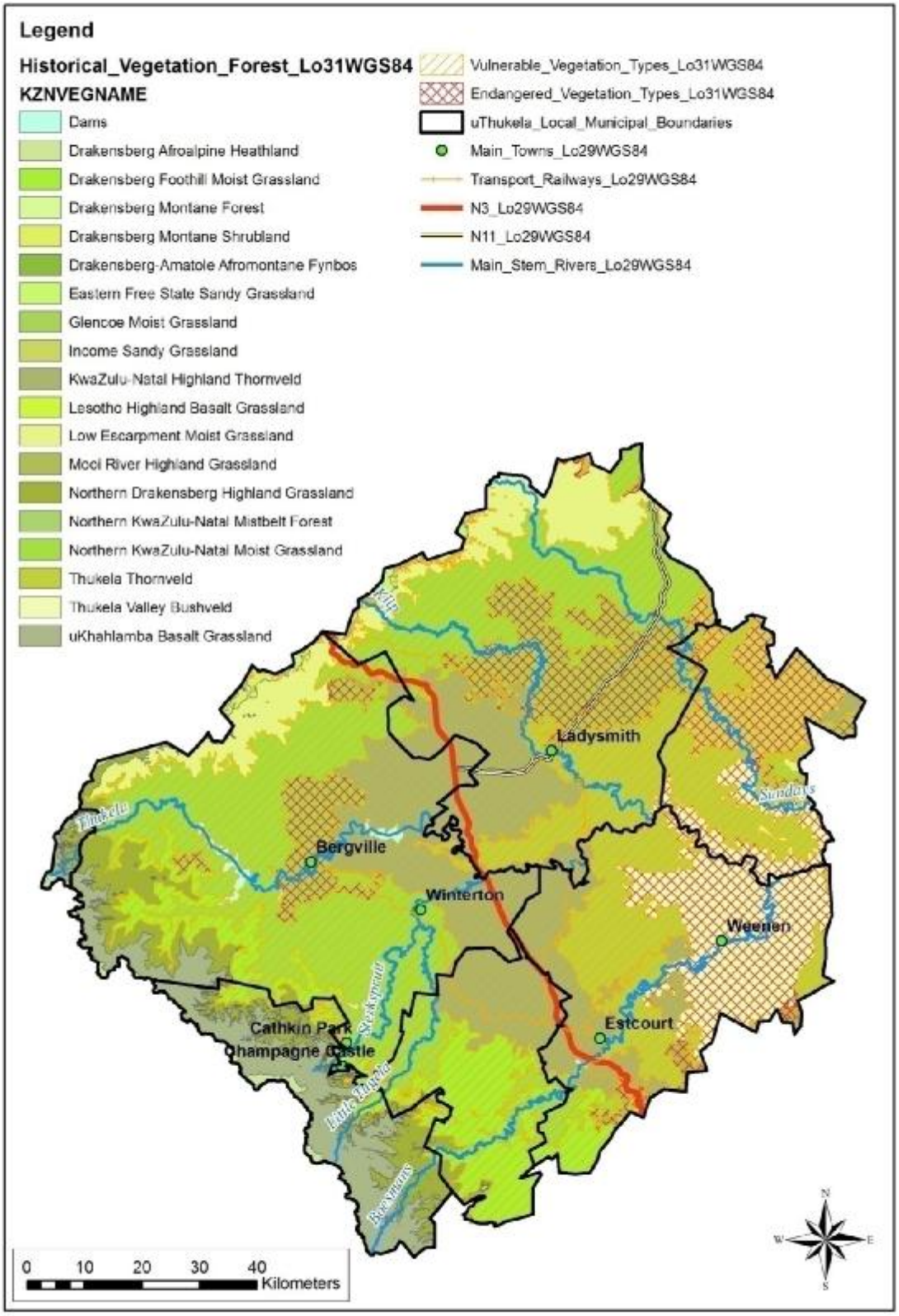


Figure 7: Vegetation Map of the District

The majority of Red Data plant species in the Drakensberg have been recorded within the UDPWHS, most likely to be on account of sampling bias. The Mnweni area is likely to comprise equivalent plant species diversity, and is therefore a key linkage connecting species in Royal Natal National Park to Cathedral Peak.

The area provides habitat for a significant number of priority Red Data and Endemic faunal species (Appendix 3). Invertebrates have not been listed. Grasslands are known in general to support high invertebrate diversity across a wide range on invertebrate taxa, but little is known about overall invertebrate distribution within the uThukela Municipality. It is assumed that invertebrate diversity is related to diversity of vegetation types and plant species. Conserving these should therefore ensure conservation of invertebrate species.

The District, particularly the Drakensberg, is considered a hotspot for amphibian and bird diversity. Threatened Cape (*Gyps coprotheres*) and Bearded Vulture (*Gypaetus barbatus)*, as well as other raptors including Black Eagles (*Aquila verreauxii*), nest on the cliffs along the Drakensberg escarpment but they forage throughout the District. Many of the above species require a large area for foraging of an individual animal, which emphasizes the importance of maintaining large areas of natural habitat for ensuring their viability. The protection and appropriate management of the remaining intact habitat within the municipality is critical to ensuring the viability of conservation important faunal and floral species listed above.

The UDPWHS and the low-lying grasslands are both designated internationally as an Important Bird Area (Code ZA048) (BirdLife International 2003).

4.3 Wetlands

Wetland systems are distributed in a complex mosaic, occupying a variety of positions in the landscape across altitudinal gradients, ranging from open water bodies such as mountain tarns, small hanging wetlands, high on valley sides, a variety of vleis and marshes, down to extensive wetlands associated with an intricate network of stream and river courses. Wetlands are of major importance for nature conservation, because of the variety of natural communities associated with them. The Afro-alpine Belt contains extensive wetlands, which, by virtue of their extremely limited distribution on the Sub-continent, possess great rarity value. Also present are important Montane Belt wetlands,

which play a key role in the hydrological cycle of the Tugela catchment, and are of particular significance for the maintenance of regular stream-flow patterns, and acceptable water quality levels. Protection of the majority of these wetlands is afforded by the UDPWHS, and the wetlands therein are on the List of Wetlands of International Importance under the RAMSAR Convention.

The rivers and associated wetlands within this District, particularly upper catchment wetlands, are of national importance. The distribution of wetlands within the District is illustrated in Figure 8.

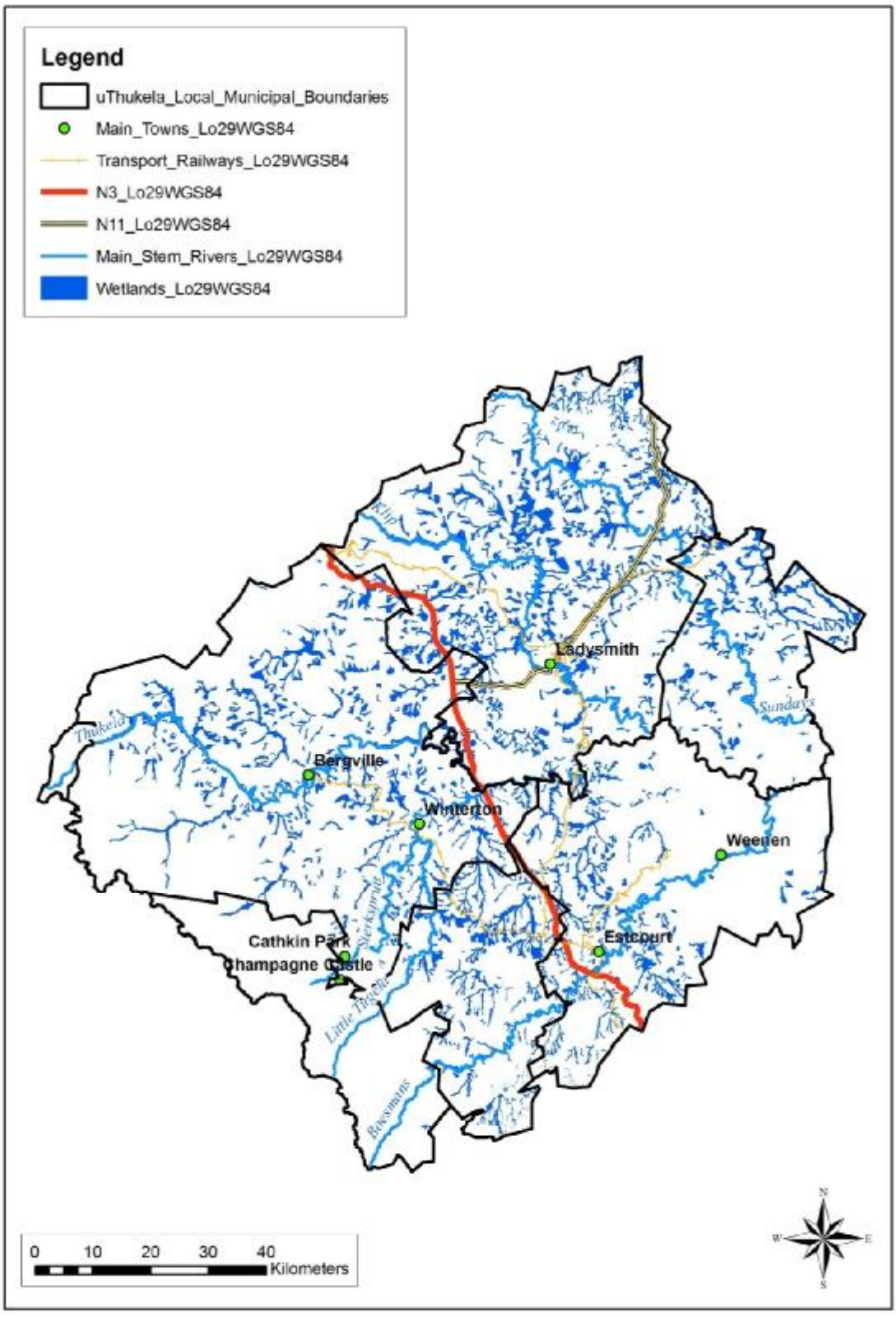


Figure 8: Map of Wetlands in the District

4.4 Ecosystem Processes and Services

Amongst a suite of ecosystem services provided within the municipality, the supply and regulation of clean water from the Drakensberg is the most significant. The availability of quality water is predicted to be the single greatest development constraint facing South Africa. South Africa has a low long-term annual average precipitation (approximately 510 mm/annum) and the MDTFCA is one of only five areas where the annual average precipitation exceeds evaporation. The Drakensberg is the most important high altitude watershed in southern Africa in terms of water yield.

The District is strategically significant as it makes up the principal catchment area for the Tugela River. This river is the key lifeline for regional development, and is also of major significance for the industrial economy of South Africa, ultimately contributing to water supply within the Vaal Dam, which supplies Gauteng, the Free State, North West, Northern Cape, Limpopo and Mpumalanga. The area supplied from the Vaal River System, generates more than 50% of South Africa's gross geographical product (GGP), more than 80% of the country's electricity. Local water resource developments within the catchment are generally small and relate primarily to the needs of farming communities, villages, and a number of towns. The largest components of existing water development infrastructure in the District are those associated with four inter-basin transfer schemes:

- The Tugela-Vaal Project through which water is transferred via the Drakensberg Pumped Storage Scheme to Sterkfontein Dam in the Vaal River Catchment.
- The Zaaihoek Scheme through which water is transferred to Majuba Power Station and the Grootdraai Dam in the Vaal River Catchment.
- The Thukela-Mhlatuze Scheme through which water is transferred to Goedetrouw Dam near Richards Bay.
- Braamhoek Pumped Storage Scheme, comprising the Wilge River system in the Free State and the Braamhoekspruit, a tributary of the Klip River.

The Tugela-Vaal Scheme (which exports water from Kwazulu-Natal to Gauteng), is totally dependent on the Tugela catchment basin. The transfer capacity of this scheme represents a large portion (about 30%) of the water resources available in the Upper Vaal Water Management Area, which is the economic heart of South Africa.

This particular municipality is therefore at the centre of water supply assurance on a provincial and national level, and performs a critical function for present and future water supply within its catchment, neighbouring municipalities, and neighbouring provinces. The wetlands, rivers, and grasslands in the District, on which sustained provision of clean water is dependent, are therefore critically important. The primary catchment area of the Tugela River is dominated by fire-climax grasslands and when these are well managed they maintain the vegetation cover that ensures the protection of the soil during precipitation events, effective absorption of water into the soil, and the slow release of the water into the system thereafter. These extensive grasslands are also important for carbon sequestration, primary production, carbon storage and nutrient cycling, and reduce soil erosion and sedimentation.

Although it appears that grass species dominate the landscape, closer inspection reveals a greater proportion and diversity of forbs as stated in the biodiversity discussion above. This diversity implies an intrinsic resilience which is what is needed, in conjunction with conservation management, to provide the guarantee for catchment integrity and water provision and regulation.

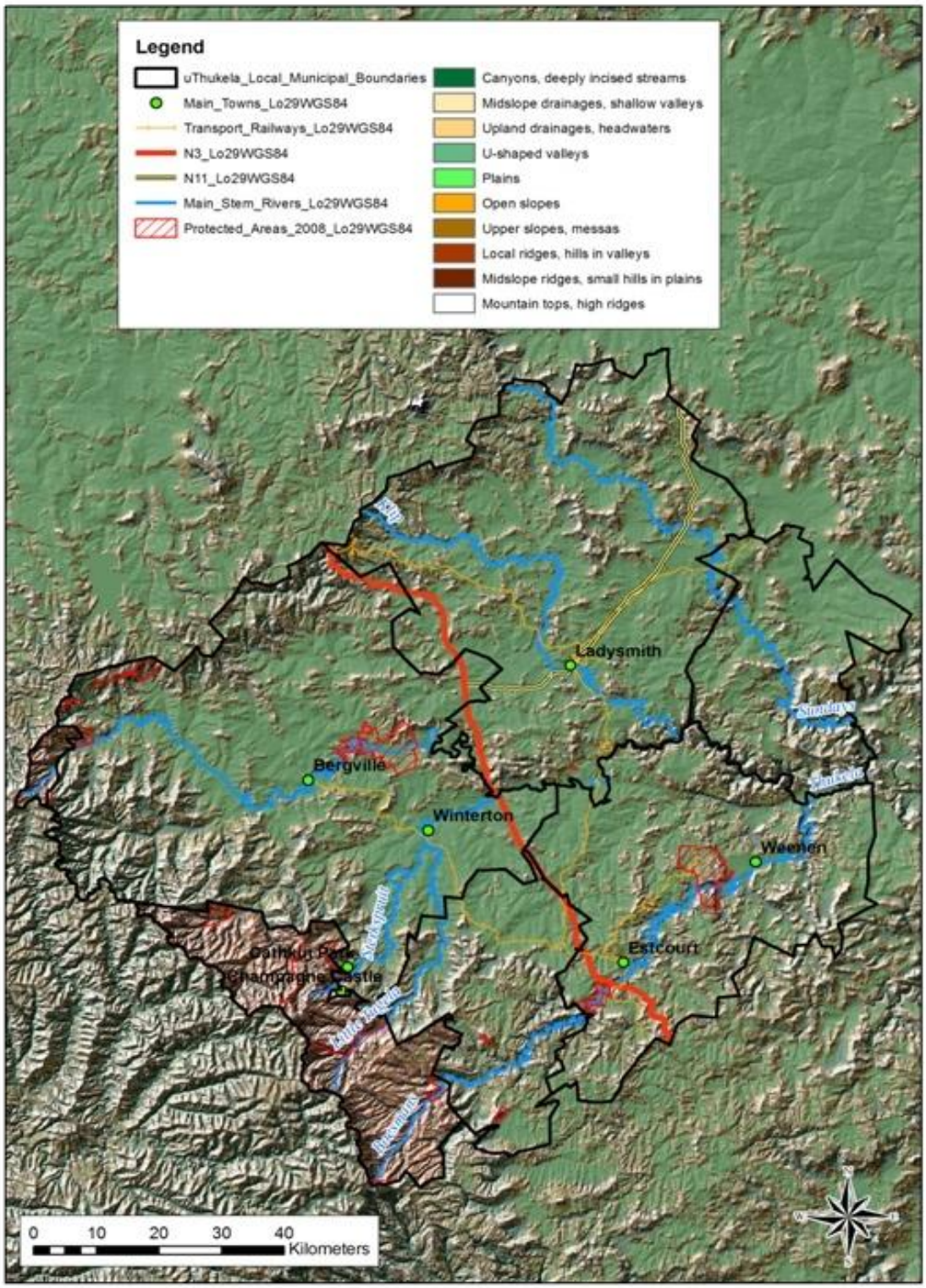
Ecological connectivity and porosity is critical in ensuring ecosystem integrity and sustained delivery of ecosystem processes and services. The municipality plays a crucial role in regional ecological connectivity, with the eastern and northern borders of the uThukela District Municipality forming an integral part of a national ecological corridor identified along the Drakensberg axis. The municipality regionally still has a high degree of corridor integrity in the north-south axis, considering vegetation units (see Section 5.3.3). East-west linkages are substantial along the northern border of the municipality, but are incomplete and fragmented further south to the extent that no other well conserved or highly intact linkages are present. Ridge line corridors are reasonably intact (most probably as a result of inaccessibility), whilst riparian corridors have to the greatest extent been fragmented on account of agricultural practices and rural and urban settlement along rivers. Lower level corridors within the municipality cater for local ecological processes, although some key linkages have been fragmented significantly.

4.5 Existing Conservation Areas

The District includes a number of Protected Areas and Wilderness Areas (Table 1 and Figure 9).

Protected Area	Category	Area (ha)
Poccolan Nature Reserve	Provincial Nature Reserve	1093
Robinson's Bush Nature Reserve	Provincial Nature Reserve	165
Cathedral Peak (UDPWHS)	State Forest1	25185
Rugged Glen (UDPWHS)	Provincial Nature Reserve	416
Giants Castle (UDPWHS)	Provincial Nature Reserve	42287
Mkhomazi (UDPWHS)	State Forest	30
Royal Natal (UDPWHS)	Provincial Nature Reserve	6935
Sungubala (UDPWHS)	Provincial Nature Reserve	74
Ingwe (UDPWHS)	Provincial Nature Reserve	40
Hlatikulu (UDPWHS)	Provincial Nature Reserve	242
Highmoor (UDPWHS)	State Forest	292
Monks Cowl (UDPWHS)	State Forest	17803
Ntabamhlope	Provincial Nature Reserve	98
Bush Reserve No1	Provincial Nature Reserve	11
Bush Reserve No 2	Provincial Nature Reserve	31
Wagendrift Nature Reserve	Provincial Nature Reserve	734
Moor Park	Provincial Nature Reserve	289
Weenen Nature Reserve	Provincial Nature Reserve	4923
Spioenkop Nature Reserve	Provincial Nature Reserve	5439
Mdedelo Wilderness Area	Proclaimed Wilderness Area	27 000
Mlambonja Wilderness Area	Proclaimed Wilderness Area	6 270

Table 1: Protected Areas in the District Municipality



…

….**Figure 9: Map of the Protected Areas in the District**

In accordance with obligations to international agreements, DEAT has provided national goals[2] of 8% and 12% for formal protection of terrestrial areas by 2010 and 2015, respectively. The uThukela District Municipality already complies with the 2010 target (including 9.4% Protected Areas currently).

4.6 Level of Transformation

The most recent Land Cover data (2005) provided by EKZNW was used to demarcate transformation in the study area. A number of land cover categories were mapped (Table 2).

Table 2 Land Classifications used in the Transformation Layer

Category	Notes
Cultivation, commercial, annual crops, dryland	These areas were considered transformed.
Cultivation, commercial, annual crops, irrigated	
Cultivation, subsistence, dryland	
Dams	
Erosion	
Golf courses	
KZN Main & District Roads	
KZN National Roads	
Mines & Quarries	
Old Fields (previously bushland)	
Old Fields (previously grassland)	
Orchards -permanent, irrigated, banana's and citrus	
Orchards -permanent, dryland, cashew nuts	
Orchards -permanent, dryland, pineapples	
Plantation	
Plantation -clearfelled	
Rural dwellings	These areas were considered transformed. Rural dwellings were also buffered by 600m based on a species: area curve for sourveld grasslands as established by EKZNW[3] .
Smallholdings -grassland	These areas were considered transformed.
Sugarcane, commercial, irrigated & dryland	
Sugarcane, semi-commercial, emerging farmer, irrigated & dryland	
Urban / Built-up	
Ingula Dam	
Additional areas of transformation (from aerial photographs)	Areas that were immediately obvious from spot imagery were manually digitised and included in the transformation layer.
Known approved developments	These areas were considered transformed.

[2] To achieve the 8 % National goal of formal protection for terrestrial areas under protection by 2010 and 12% by 2015, SANBI and DEAT requested that EKZNW compile a list, in accordance with obligations to international agreements, that indicates the most important land holdings that would be required for conservation management.

[3] Impacts of goats, cattle, wood harvesting, hunting, disturbance around rural settlements has a significant negative impact on biodiversity.

Rural settlement and agricultural activities are responsible for the majority of land transformation in the District (Figure 10). The highest transformation levels occur along the foothills of the Drakensberg and the eastern boundary of the municipality.

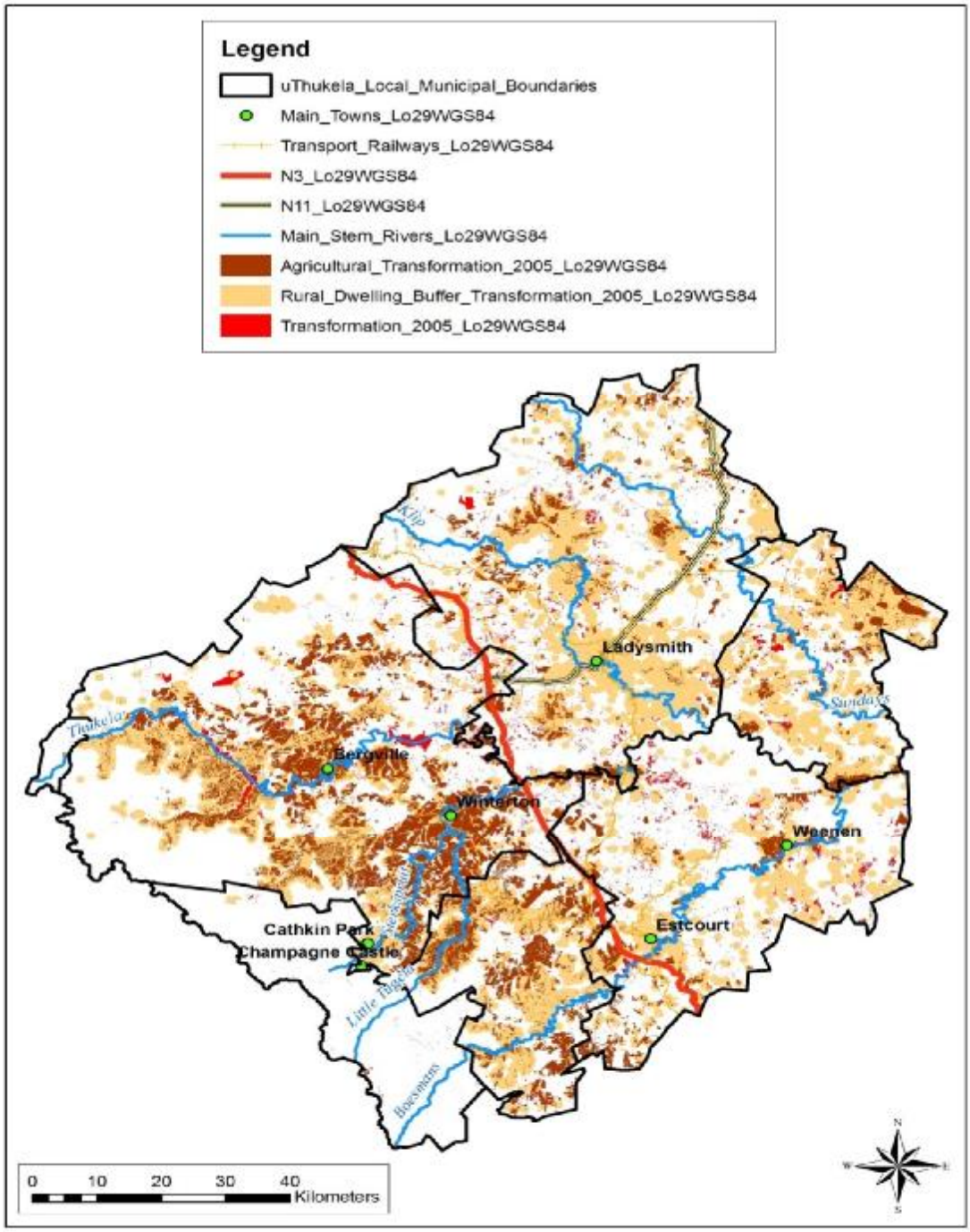


Figure 10: Map of Transformation in the District

4.7 The National Spatial Biodiversity Assessment

The NSBA (Driver *et al*, 2005) complements the NBSAP, led by DEAT, which is a component of South Africa's obligations as a signatory to the Convention on Biological Diversity (CBD). The NSBA produced a comprehensive national spatial assessment of South Africa's biodiversity, identifying geographic priority areas for action, for informing policies, plans and actions of a wide range of public and private sectors. The NSBA identifies the uThukela District Municipal region as nationally important in terms of biodiversity, and the following is noted:

- The Drakensberg is an important Biogeographic Node, where many different vegetation types occur, creating zones of ecologically important interactions, including high endemicity.
- The NSBA also identifies the Great Escarpment as a key topographic feature in the South African landscape, associated with altitudinal and climatic gradients, ecological processes, and migration routes.
- The NSBA has identified the escarpment area as a priority species area that has many species of special concern found nowhere else; the escarpment has a high species conservation value along its extent.
- The uThukela District Municipality features high in terms of terrestrial priority areas (the South Eastern Escarpment), based on combined analyses of species, ecosystems and ecological processes; these areas are considered priority areas in terms of conservation actions.
- The uThukela District Municipality is an important water production area in South Africa, comprising rivers that are either intact or have a high potential for rehabilitation; water is South Africa's most critical natural resource. The relatively undisturbed nature of the main stem rivers in the uThukela District Municipality renders these rivers good options for conservation planning; however, consistent yield of high quality water relies on a cover of good condition natural vegetation.

5. BIODIVERSITY FEATURE MAPPING

5.1 Introduction

The purpose of this exercise was to map the critically important biodiversity features and ecological processes required for meeting biodiversity targets within the District. This was achieved through a

spatial assessment of all available biodiversity information for the District, selecting those areas that represent the best options for achieving biodiversity targets. The final product is a series of maps highlighting those areas that are critically important for biodiversity, with accompanying land-use planning and decision-making guidelines. Maps important in decision-making are included in the report.

The Guideline regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans (DEAT, 2008) refers to Critical Biodiversity Areas (CBAs) and Critical Ecological Support Areas (CESAs). In terms of this guideline and the SANBI Bioregional 30 Planning Workshop (September 2008), a CBA is considered an area that is irreplaceable and highly significant, and needs to be maintained in a natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. It comprises an area that is vital to ecosystem / species persistence (based on a biodiversity feature relative to its target). Maintaining an area in a natural state can include biodiversity-compatible land uses and resource uses. Critical Ecological Support Areas are areas that are not essential for meeting biodiversity targets but which nevertheless play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in CESAs may be lower than that recommended for critical biodiversity areas. Corridors are generally defined as CESAs, especially if providing links between CBA areas. Where a critical corridor is in the process of being broken or is under threat of being broken, then it was defined as CBA. The BSP also included areas important for ecosystem services as CESAs.

The following biodiversity features were included in the CBA maps:

- EKZNW terrestrial systematic conservation plan - Irreplaceable areas
- EKZNW Aquatic Earmarked Catchments
- Vegetation types
- Individual plant species of conservation significance
- Individual animal species of conservation significance
- Wetland types
- Babangibone Development Node corridor linkage

- Upper and Lower Thukela corridor linkages
- Protected Areas

Ecological processes operating across a range of temporal and spatial scales are critical for maintaining biodiversity. Conservation planning is essentially a spatial analytical process, and it is therefore necessary that ecological processes are mapped. Mapping of processes was done through the identification of spatial surrogates which describe the geographic distribution of key ecological processes operating to ensure the persistence of biodiversity within the planning domain. Ecological processes were also integrated into conservation planning through choices made in compiling the various layers used in the planning procedure as well as in rules and decisions applied during area selection / and prioritisation. It was decided to limit consideration of ecological processes and ecosystem services to those critically linked to biodiversity conservation at the District scale, considering hydrological process and ecological connectivity.

The following features were included in the maps of Critical Ecological Support Areas (CESA):

- Important national, regional and local corridors for biodiversity
- All wetlands for their role in hydrological functioning
- Important water yield areas
- Important stem rivers and quinery catchments[4] intersected by these rivers
- Ridge lines and quinery catchments intersected by these ridgelines

In addition to the CBA and CESA maps, the following were also mapped:

- Transformation areas where essentially no natural vegetation remained, including eroded areas and areas unlikely to present viable long term options for conservation.
- Areas of natural vegetation not required to meet biodiversity targets.

[4] Water catchments are classified as follows, from largest to smallest: Primary, Secondary, Tertiary, Quaternary,and Quinery catchments, each are nested within the previous category.

- Areas in which possible future land use is likely to be incompatible with biodiversity Conservation

    - o High potential agricultural land
    - o Good potential agricultural land
    - o Potential mining areas
    - o Potential commercial forestry areas
    - o Areas of high erosion potential
    - o Identified development nodes
    - o Municipal growth areas as identified by the District Spatial Development Framework

The above maps and associated land use guidelines should serve to focus conservation efforts in the District, and feed into multi-sectoral planning and assessment processes.

5.2 Methodology

Biodiversity features mapped were clearly defined and delineated according to very specific criteria, with a defensible rationale for their selection. The selection of areas was based on conserving biodiversity within areas where the majority of targets can be achieved at the lowest area cost considering potential threats to biodiversity. Biodiversity targets were based on sound underlying ecological principles and existing quantitative data where available. Targets were not set for ecological processes; rather priority areas were identified. A summary of targets is provided in Table 3.

Table 3 Biodiversity Targets for Identified Biodiversity Features

Biodiversity Feature	**Target**
SANBI vegetation map types	23-28% of the vegetation type as per EKZNW targets
Forest types	64-72% of forest patches as per EKZNW targets; the remaining forests were also mapped due to their scarce and localised distribution within the planning domain, and on account of their inferred protection through the National Forests Act
Wetland types	20% of the total area of each wetland type including 100m buffers; 100% of the wetlands (including 30m buffers) to cater for hydrological processes
Priority species (fauna & flora)	100% of all known locations

The mapping exercise as a first step captured the EKZNW terrestrial and aquatic systematic biodiversity plans, was augmented with more detailed information obtained from expert opinion, key stakeholders[5], local knowledge, additional Geographic Information Systems.

The following surfaces for Geographical Information Systems were included in the assessment:

- EKZNW terrestrial systematic conservation plan
- Aquatic Earmarked Catchments
- Vegetation types
- Red Data Species
- Locations of priority plant species (*Barleria greenii*, *Barleria*
- *argillicola*, *Calpurnia woodii*, *Hemizigia bulosii*)
- Locations of priority animal species (Vultures, Cranes, Southern
- Ground Hornbill, Oribi)
- Rivers
- Quinery catchments
- Wetlands and Classifications
- Important water yield catchments
- National Ecological Corridor
- Protected Areas
- EKZNW Protected Areas Expansion
- EKZNW Game Ranches
- Sites of Conservation Significance
- Conservancies
- Living cultural heritage sites
- 2005 EKZNW Transformation layer
- Existing and Potential Mining Areas
- Agricultural potential

[5] The following key stakeholders were contacted, *inter alia*, EKZNW (Protected Areas Planning, Biodiversity Planning, Biodiversity Research, District Conservation Officers, Ecological Advice, Officers in charge of reserves), Non-Governmental Organisations / Conservation Authorities (SANBI (and Enkangala Grassland), WESSA, EWT, WWF, Bergwatch, Maloti Drakensberg Transfrontier Programme), Organs of State (uThukela District Municipality, Okhahlamba Local Municipality, Department of Agriculture and Environmental Affairs, Department of Water Affairs and Forestry, Transnet, Department of Minerals and Energy, Department of Transport (National and Provincial), Tourism KZN, Amafa aKwaZulu-Natali), and Eskom

- Erosion potential
- uThukela District Municipality SDF
- uThukela District Municipality Infrastructure Data
- Tribal and Urban area demarcations
- Cathkin Park development node
- Babangibone development node
- Preliminary Royal Natal National Park – Cathedral wilderness
- delineation
- Land Restitution Data
- ENPAT forestry data
- Potential Small-grower forestry data
- Spot-5 Imagery
- 2005 Landcover for uThukela
- 1: 50 000 Topological Maps
- 100m and 50m Contours

All CBAs and CESAs were represented separately on individual maps, supported by a series of lower order maps. Contextual information, such as towns, roads, administrative boundaries, and rivers were included in the maps for reader orientation (included as a separate map in Appendix 5). The level of detail in the mapping exercise was dependent on the quality of the input data. The most accurate, up-to-date data available were used in the mapping exercise. The mapping scale was set at a minimum of 1:50 000 to achieve a reasonably high level of spatial accuracy. This was considered an appropriate scale for informing land-use planning and decision-making in this District. The information has been presented in a format to allow for periodic review and updating of the information. The GIS layers and accompanying metadata have been compiled in accordance with the standards set by SANBI's Biodiversity GIS Unit.

A coarse rule-based approach was integrated into the mapping exercise where appropriate, including the following:

- Protected Areas and Irreplaceable areas (in terms of the EKZNW terrestrial systematic conservation plans) formed the basis of area selection, where possible establishing linkages

and selecting adjacent areas in order to achieve biodiversity targets. Areas within private nature reserves and game reserves were only specifically integrated into the maps where these areas were considered a more compatible land use in comparison to other land use options in an area.

- The mapping exercise aimed to maximise connectivity through a system of ecological linkages within the district and with adjoining districts. Cognisance was taken of important biodiversity linkages into adjacent municipalities.
- Areas of transformation and human activity were avoided to reduce the likelihood of edge effects on important biodiversity areas.
- Large areas were selected in preference to small areas on account of the impact of fragmentation. The preferred shape of selected areas comprised those with a low edge-to-area ratio, which minimizes edge effects. Parcels of land less than 12 hectares in extent were excluded from area selection unless such patches comprise known important biodiversity features.
- Areas comprising significant altitudinal gradients and high diversity of relief were selected wherever possible to allow for species shifts in response to climate change.
- A risk-averse approach was adopted where possible whereby those areas with the least threat and highest likelihood of being well managed were selected in preference to areas at risk

5.3 Critical Biodiversity Areas

5.3.1 EKZNW Terrestrial Systematic Conservation Plan

The EKZNW systematic terrestrial conservation plan for the District was incorporated into the maps by clipping the Irreplaceable areas in the Provincial plan to the District. The systematic conservation plan is a spatially explicit map that identifies those portions of land that are required in a compatible type of land use so that the biodiversity goals and targets for the Province can be achieved.

Critically important areas (CPlan Irreplaceability >80 Percent) were located in the north-east and central southern portion of the District, as illustrated in Figure 11.

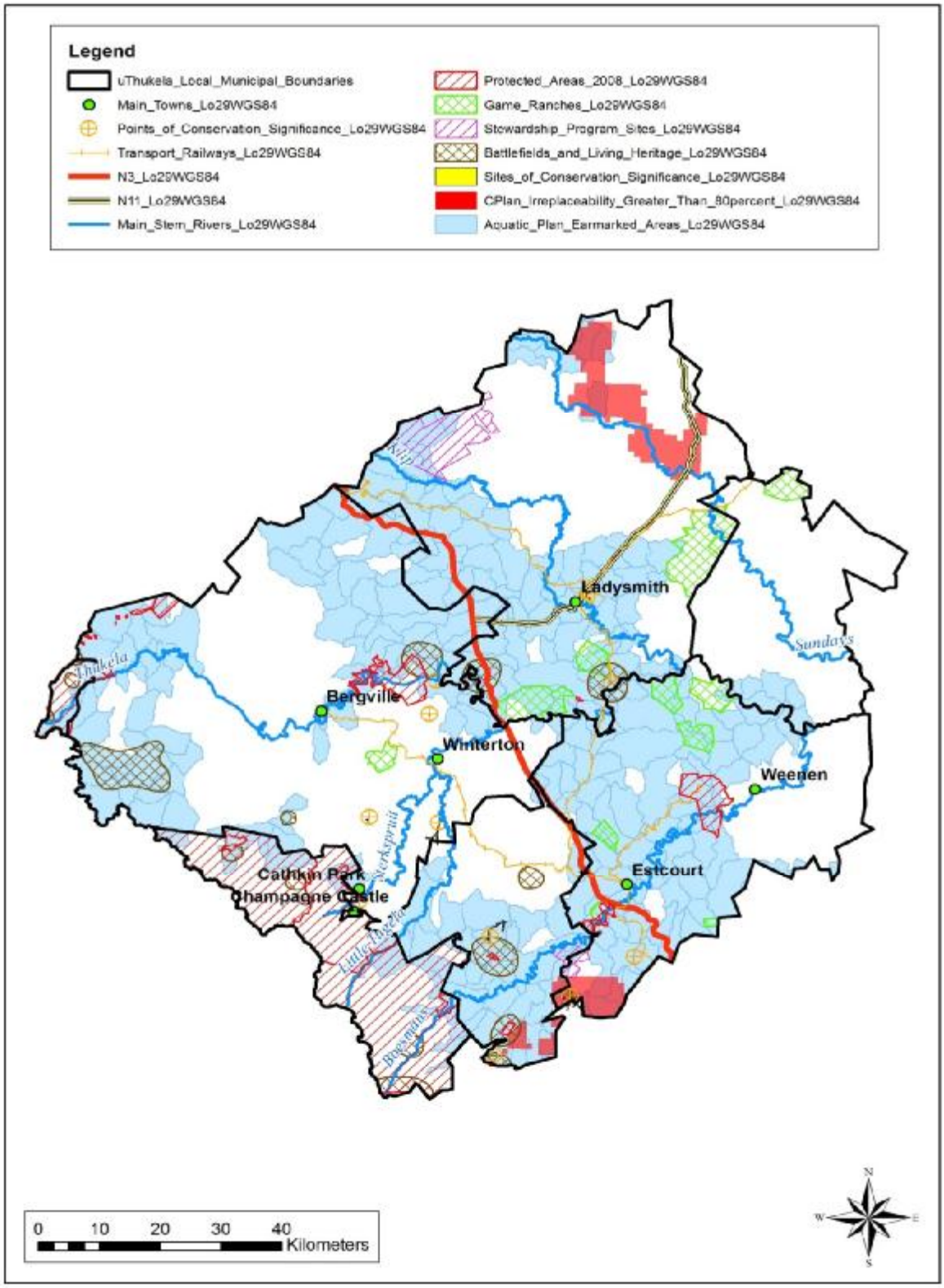


Figure 11: Aquatic Terrestrial Priority Areas

5.3.2 EKZNW Aquatic Earmarked Catchments

The EKZNW systematic aquatic conservation plan for the District was incorporated into the maps by clipping the Earmarked (Irreplaceable) areas in the Provincial plan to the District. The systematic conservation plan is a spatially explicit map identifying those portions of land that are required in a compatible form of land use so that the biodiversity goals and targets for the Province can be achieved.

Critically important areas were located predominantly in the centre of the District in a north-south axis, along the southern boundary of the District towards the west, and along the Drakensberg escarpment, particularly in the north-western corner (including the area between Cathedral Peak and Royal Natal National Park), as illustrated in Figure 11 above.

5.3.3 Vegetation Types

SANBI have adopted the vegetation types described and mapped by Mucina and Rutherford (2006) as the basis for conservation planning of country's ecosystem types. These vegetation types supersede all previous efforts of national and provincial vegetation classification (e.g. Acocks 1953, Low & Rebelo 1996, and Camp 1999) and therefore have formed the basis of this exercise in conservation planning. However, EKZNW uphold additional vegetation types in the Province, and vegetation mapping and targets were therefore based on the EKZNW vegetation type set.

Target sources for vegetation types were obtained from EKZNW. Note that the percentage target applies to the historical extent of that vegetation type in the country, and that this percentage was applied to the District planning domain. Vegetation targets were increased by ±5% for each vegetation type on the assumption that the extent of transformation is likely to have exceeded that revealed by the 2005 Landcover Data, possible errors in the 2005 Landcover Data, and potential edge effects. Table 4 lists the vegetation type targets.

Table 4 Biodiversity Targets for Vegetation Types

Vegetation Type	EKZNW vegetation conservation target	KwaZulu-Natal Conservation Status
Drakensberg Montane Shrubland	28%	Least threatened 28
Drakensberg-Amatole Afromontane Fynbos	27%	Least threatened
Eastern Free State Sandy Grassland	24%	Least threatened
Lesotho Highland Basalt Grassland	27%	Least threatened
Low Escarpment Moist Grassland	23%	Least threatened
Northern Drakensberg Highland Grassland	27%	Least threatened
uKhahlamba Basalt Grassland	27%	Least threatened
Glencoe Moist Grassland	24%	Endangered
Income Sandy Grassland	24%	Endangered
Mooi River Highland Grassland	23%	Endangered
Thukela Valley Bushveld	25%	Endangered
Drakensberg Foothill Moist Grassland	23%	Vulnerable
KwaZulu-Natal Highland Thornveld)	23%	Vulnerable
Northern KwaZulu-Natal Mistbelt Forest	72%	Vulnerable
Northern KwaZulu-Natal Moist Grassland	24%	Vulnerable
Thukela Thornveld	25%	Vulnerable
Drakensberg Afroalpine Heathland	27%	Least threatened
Drakensberg Montane Forest	64%	Least threatened

Included vegetation areas should be sufficiently large to allow for the occurrence of disturbance processes (e.g. fire), and the subsequent recovery of biodiversity features after a disturbance. Furthermore, larger areas will potentially be able to support larger populations with a greater chance of persistence in the long term. It was sought to select areas with the potential to maintain viable populations for a wide range of species with a wide range of area requirements. Small remnant areas smaller than 12 ha were therefore excluded, unless in Protected Areas, recognising that the species whose area requirements would be met on these areas would be accommodated in any event. In addition, small areas are more vulnerable to transformation and it is more difficult to manage biodiversity on them. Accordingly, the largest contiguous areas possible were selected, retaining connectivity between vegetation types. The latter rule did not apply to Afromontane forests as small patches and habitat edges appear to be ecologically viable (Kotze and Lawes, 2007).

Forest areas that were not included within target areas were included in the vegetation maps due to the scarce and localised distribution of forests within the planning domain, and on account of their inferred protection through the National Forests Act.

Vegetation statistics are provided in Appendix 4 and the selected areas have been mapped in Figure 12.

The outcomes of the mapping exercise were as follows:

a) Targets were achieved for all vegetation types apart from Income Sandy Grassland. SPOT imagery revealed that most Income Sandy Grassland modelled as intact was in fact, degraded and unlikely to contribute significantly to conservation. The above vegetation type was also highly fragmented, with a significant area comprising parcels of land less than 12 hectares in extent.

b) Northern Drakensberg Highland Grassland and uKhahlamba Basalt Grassland areas selected exceeded their required targets because they occurred mostly (entirely) within Protected Areas which were automatically included in the vegetation map.

c) Targets for Drakensberg Montane Forest were achieved within protected areas, whilst Northern KwaZulu-Natal Mistbelt Forest fell outside of existing protected areas. However, Northern KwaZulu-Natal Mistbelt Forest is predominantly located in relatively inaccessible areas, which infers a degree of protection to these areas.

d) The final configuration of vegetation areas was successful in ensuring connectivity among vegetation types, linking lower-lying Protected Areas with large parcels of intact vegetation, and establishing a north-south corridor through the centre of the District. However, high transformation levels along the foothills of the Drakensberg and the eastern boundary of the municipality prohibited the development of meaningful east-west vegetation linkages, apart from a high altitude linkage along northern boundary of the municipality. Two corridors were identified to create another east-west linkage; however these are under significant pressure.

e) Limited available areas for meeting conservation targets of some vegetation types meant that selecting areas without significant threat was not always possible. The most significant threat comprises potential agricultural development, forestry development and mining, in the north, south and north east of the District, respectively.

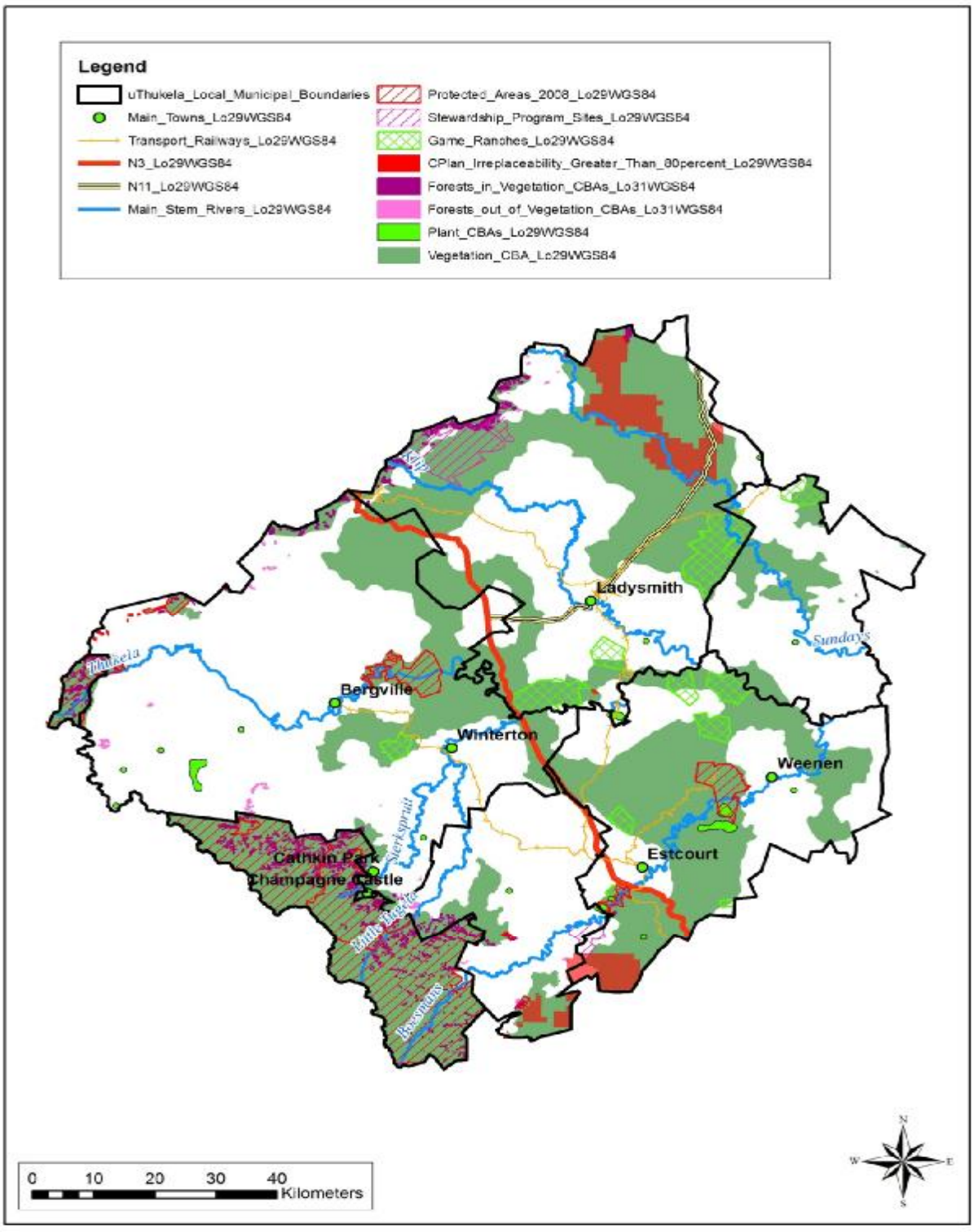


Figure 12: Plant Species and Vegetation Critical Biodiversity Areas

5.3.4 Plant Species

On account of the strong influence of habitat and other environmental factors (e.g. distance from settlement; proximity to protected, and river corridors) on the current distributions of priority plant species, including these environmental factors in the conservation assessment would adequately accommodate the priority plant species. Non-priority plant species were considered to be adequately conserved within CBAs and CESAs and were thus not explicitly considered in the conservation assessment because terrestrial and aquatic habitats act as surrogates for them.

A 100 % target of all known locations was set for priority plant species in order to secure their persistence. Ecologists and organisations with significant local knowledge were requested to identify important locations for these species. The majority of priority species occur at high altitude within the UDPWHS, in areas unlikely to be impacted; these species were therefore not included in the assessment. For the others, all areas containing a known location of at least one priority species were selected.

In cases where a priority plant species location did not fall within an area designated for meeting vegetation type targets, a buffer of 500m was seen as appropriate for ensuring the persistence of this species, acknowledging that sampling in that area may be inadequate and it is likely that other specimens of this species are found in that locality. It was possible to incorporate the locations of all known locations of most of the priority species into the vegetation type CBAs. Appendix 2 lists these priority species; CBAs illustrated in Figure 12 above.

5.3.5 Fauna

Habitat and other environmental factors (e.g. distance from settlement; proximity to protected areas, river corridors) may strongly influence current distributions of animal species. Inclusion of these factors was therefore deemed to integrate adequately animal species in the assessment. A persistence target of 100% was set for all priority species, whose localities were mapped where accurate information was available.

For a set of priority species (Table 5), all known recent locations, or nesting or roosting sites of birds with large ranges (e.g. vultures), were included. Important bird species were identified from Barnes (2000). Any such location was deemed to be a CBA. In the case of Southern Ground Hornbill within

the Cathkin Park Development Node, in addition to mapping known and potential nesting and roosting sites, significant areas of the node were included in the vegetation CBA to provide meaningful habitat for this species (Figure 13).

Wattled Crane nest site buffers included any intersecting wetlands to ensure sustained wetland functioning critical to this species.

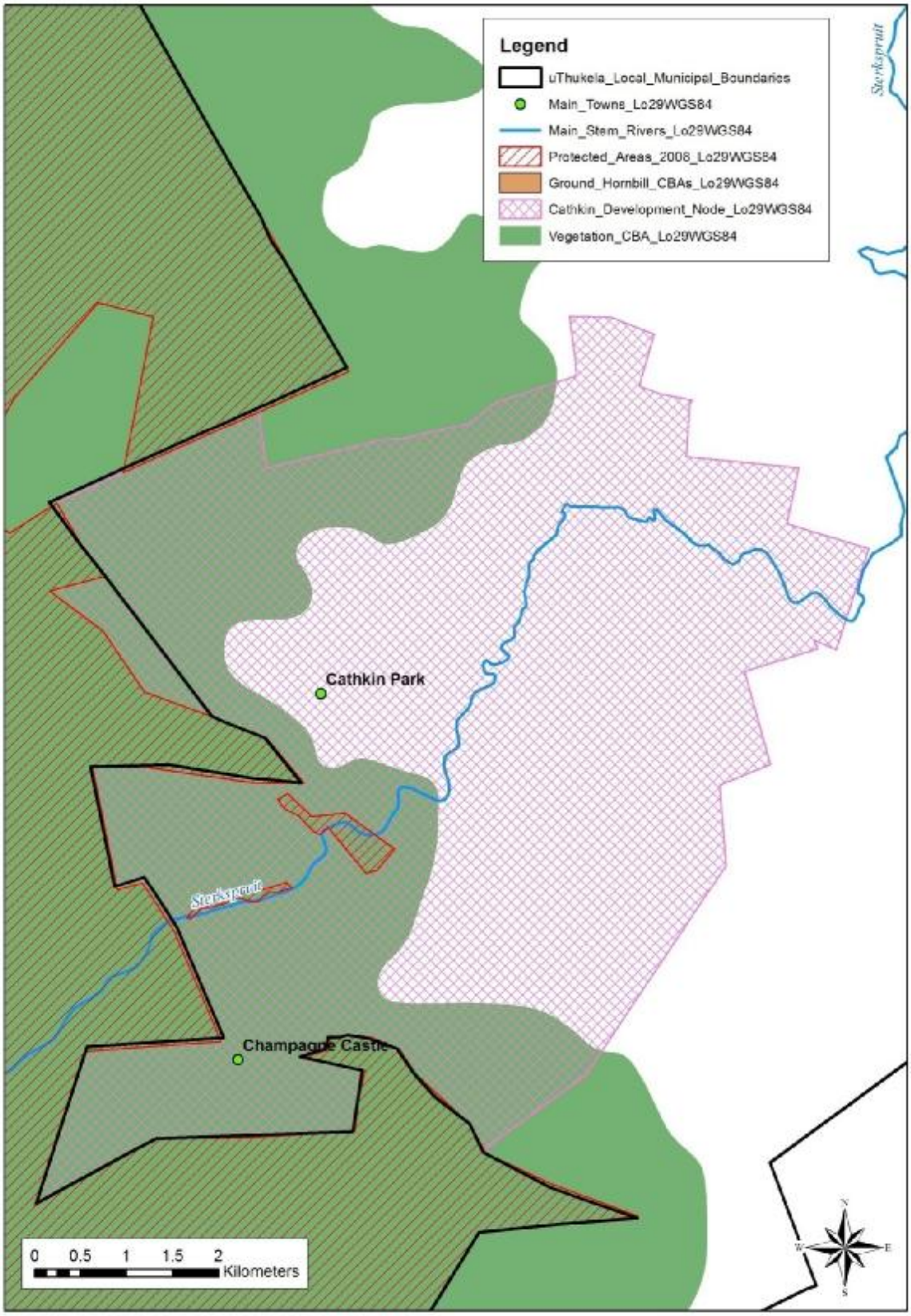


Figure 13: Cathkin Park Development Node Vegetation CBA and Ground Hornbill Nesting /Roosting CBA

Table 5Priority Faunal Species

Taxonomic name	Common Name	Animal type	Conservation Status
Anthropoides paradisea	Blue Crane	Bird	Vulnerable
Balearica regulorum	Grey Crowned Crane	Bird	Vulnerable
Grus carunculatus	Wattled Crane	Bird	Critically Endangered
Bucorvus cafer	Southern Ground-Hornbill	Bird	Vulnerable
Gyps coprotheres	Cape Vulture	Bird	Vulnerable
Gypaetus barbatus	Bearded Vulture	Bird	Endangered
Ourebia ourebi	Oribi	Mammal	Endangered

Non-priority species were considered to be catered for within vegetation CBAs and CESAs. These species were therefore not explicitly considered in the conservation assessment, as terrestrial or aquatic habitats act as adequate surrogates for these species. Critical Biodiversity Areas are illustrated in Figure 14

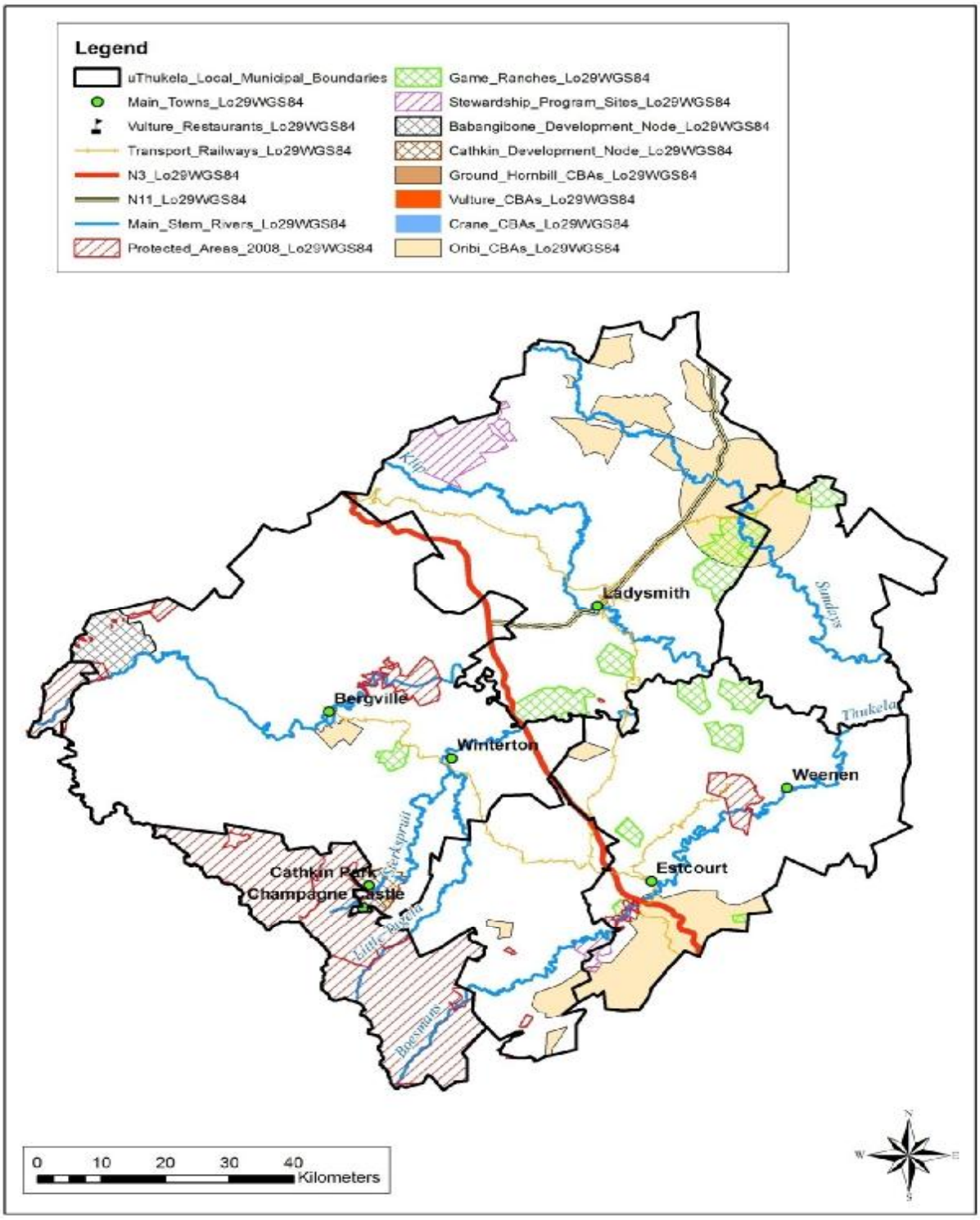


Figure 14: Critical Biodiversity Areas for Animals

5.3.6 Wetland Types

It is preferable for areas selected for the conservation of freshwater biodiversity features to be of high ecological integrity as they will most accurately represent the biodiversity of a region. Preference was therefore given to areas which presented a realistic opportunity for the persistence of natural hydrological regimes. Selecting areas of high ecological integrity also provides a more pragmatic solution, as selected areas would be closer to natural conditions, thus requiring less management intervention (for example rehabilitation).

Wetland mapping was carried out using the Ezemvelo KZN Wildlife wetland dataset (from which dams were removed). Wetland types included in the study comprised Montane, Highland, Midland, and Lowland types, as defined by EKZNW criteria. Whilst not mapped in the planning domain, every effort should be made to conserve high altitude bogs, due to the critical water supply and discharge function of these bogs, as well as their role as filters in the maintenance of water quality. It was decided that these areas were adequately protected in the District within Protected Areas, with the exception of the area between Cathedral Peak and Royal Natal National Park, and the areas to the east of Royal Natal National Park. These areas are relatively inaccessible and therefore less likely to be impacted. High altitude bogs were therefore not included in the study.

The study adopted the 20% national standard for wetland conservation, and included a 100m buffer on all wetlands to ensure persistence of important wetland biodiversity features. Entire wetland units were selected for achieving the target i.e. fragments of wetland units were not selected as wetlands comprise functional units and must stay entirely intact for ecological functioning. The areas selected for achieving the 20% target for each wetland type were identified as follows:

- Intact wetlands were identified by subtracting the EKZNW transformation layer (excluding buffers to rural dwellings) from the wetland areas.
- Wetlands were selected in order of preference as below:
    - o All wetlands contained within and intersecting with Wattled Crane nest site buffer areas
    - o All wetlands contained within and intersecting with Protected Areas
    - o Wetlands contained entirely within the vegetation type CBA
    - o Wetlands not contained entirely within, but intersecting a vegetation

CBA, selecting the largest wetlands

The above process secured wetlands within areas of least transformation. Whilst the majority of the selected wetlands overlapped with Earmarked Aquatic planning units, it was decided that Earmarked Aquatic planning units should not form the basis of selection. This was on account of a relatively higher level of transformation in these areas as opposed to the vegetation type CBA.

Wetland type targets were achieved within Protected Areas, the vegetation type CBA, and Wattled Crane nest site buffer areas (illustrated in Figure 18).

5.3.7 Babangibone Development Node Corridor Linkage

In terms of the SANBI Bioregional Planning Workshop (September 2008), if a critical corridor is under threat of its linkage being broken, then it is defined as a CBA. The Babangibone area has been identified as a potential development node in the Special Case Area Plan and Drakensberg Approaches Policy. The proposed Babangibone Development Node (Figure 15), if developed, represents a significant threat to national connectivity along the east-west National Ecological Corridor identified in the NSBA, the EKZNW Biodiversity Corridor, and the link through to Sterkfontein Dam. The relatively intact natural areas within the proposed Babangibone Development Node, relatively less suitable for development (as defined in the DAP), forming part of the National Corridor, have therefore been designated a CBA.

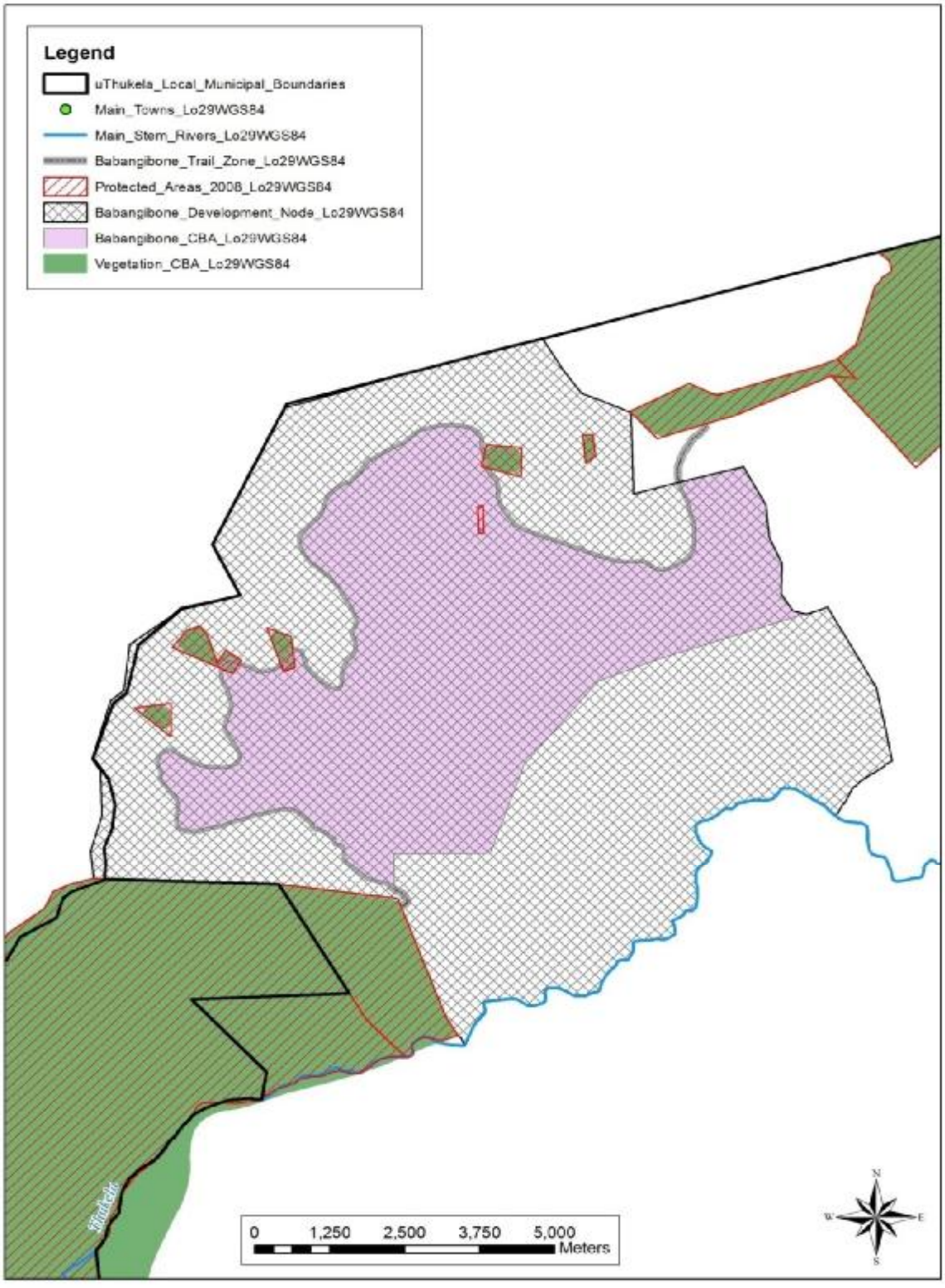


Figure 15: Babangibone Development Node Sector Plan

Existing Protected Areas formed a core for achieving biodiversity targets through selecting adjacent areas as part of vegetation CBAs and establishing linkages. This served to buffer Protected Areas and to increase their spatial scale of ecological functioning. This would serve to increase the likelihood of conserving key species and habitats within reserves at the level at which they occurred when the KZN Systematic Conservation plan was developed.

A Protected Area is defined as:

- any area declared or proclaimed as such in terms of section 3 or listed in the Second Schedule to the KwaZulu-Natal Nature Conservation Management Act No. 9 of 1997; or
- any of the protected areas referred to in section 9 of the National Environmental Management: Protected Areas Act No. 57 of 2003

The area selection process highlighted that the spatial distribution of Protected Areas in the District was not adequately aligned across biophysical gradients, and was distorted in favour of upland areas. Fortunately, lower lying Protected Areas were nested within largely natural areas, which have the potential to be linked to each other and higher altitude areas towards the north of the District, offering opportunities for Protected Areas Expansion along altitudinal gradients. This is relevant for accommodating altitudinal movement of species in response to climate change.

To achieve the 8 % National goal of formal protection for terrestrial areas under protection by 2010 and 12% by 2015, SANBI and DEAT have requested that EKZNW compile a list, in accordance with obligations to international agreements, that indicates the most important land holdings that would be required for conservation management (Wakelin & Porter, 2007, unpublished). The uThukela District Municipality already complies with the 2010 target (including 9.4% Protected Areas currently). The vegetation CBA has, where possible, made provision for the most important land holdings identified by EKZNW for the Protected Area Expansion programme.

The high altitude area between Royal Natal National Park and Cathedral Peak, identified as part of the National process for expansion of the UDPWHS, was not included in the EKZNW evaluation described above as this planning domain was being investigated by MDTP. However, EKZNW has recognised the importance of this linkage (Ezemvelo KZN Wildlife, 2005; Ian Rushworth & Oscar Mthimkhulu, EKZNW, 2008, unpublished). As a condition to listing the Ukhahlamba Drakensberg Park on UNESCO's World Heritage List, the World Heritage Committee recommended to the State party to the Convention that the area lying between Royal Natal National Park and Cathedral Peak is secured for its outstanding universal values and thus accept and require that this World Heritage Site

is expanded. This is considered to be an international obligation that South Africa must comply with in terms of its responsibilities under the World Heritage Convention. The BSP also recognises the critical importance of formal protection of this area.

The existing Protected Area Network was included in the base layer for the District. The biodiversity buffer layer derived from a current EKZNW UDPWHS buffer study (Ian Rushworth & Oscar Mthimkhulu, EKZNW, 2008, unpublished) was incorporated into the mapping exercise as a critical component of the UDPWHS (Figure 16). Land owner Associations, such as conservancies, were not included on the maps. Private Game Reserves and Private Nature Reserves were mapped as second order conservation areas; the latter designation was assigned as land under private ownership is generally subject to commercial land use which in most circumstances does not translate into conservation objectives and goals. It is however recognised that these areas represent opportunities for stewardship initiatives and protected area expansion.

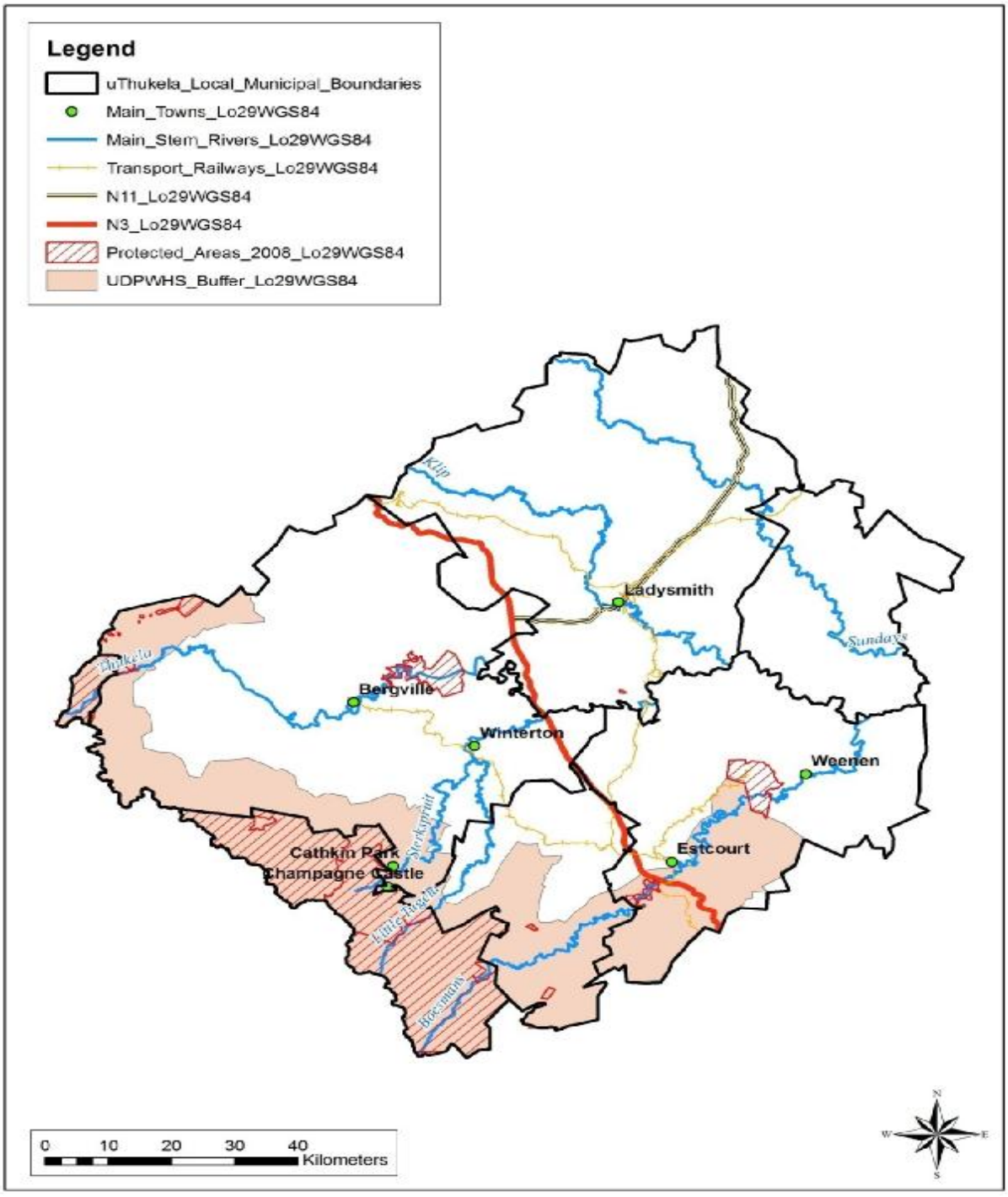


Figure 16: Protected Areas and UDPWHS in the District

5.4 Critical Ecological Support Areas

5.4.1 Ecological Corridors

The maintenance of connectivity is essential to a number of movement-related ecological processes, including species migrations, seasonal and altitudinal dispersal, and range displacement in response to climate change.

The ecological corridor CESA does not relate to specific biodiversity targets, but rather regional connectivity to ensure persistence of ecosystem processes. A number of ecological principles formed the basis of the area selection process, as follows:

a) Corridors located along major climatic and upland-lowland gradients, including east–west and north-south corridors, were selected in order to cater for potential impacts of climate change on the biota of the region.
b) The principle of connectivity within and between vegetation types was a key principle in the selection of vegetation CBAs. The vegetation CBAs therefore formed the basis of the vegetation corridor CESA for the District.
c) Large areas were selected in preference to small areas on account of the impact of fragmentation.
d) Vegetation corridors were demarcated to align with corridors identified by the NSBA, the MDTP, and EKZNW.

The NSBA has identified an ecological corridor along the Drakensberg as a key national topographical corridor, which would further serve to protect healthy high altitude grasslands that are vital for catchment integrity, and water provision and regulation. This corridor area currently does not have in place the guarantees to ensure long term protection of natural asset, and is in part under significant threat.

The proposed Babangibone Development Node (identified in the Special Case Area Plan and Drakensberg Approaches Policy) represents a potential threat to connectivity in the east-west direction of the national topographical corridor. The Babangibone Development Node, extending from the escarpment into the foothills of the Drakensberg, has the potential to cause a complete break in the corridor. The relatively intact natural areas within the proposed Babangibone Development

Node, forming part of the National Corridor, have therefore been designated a CBA, in addition to forming part of the ecological corridor.

The areas to the east of the Babangibone Development Node along the northern boundary of the District were incorporated into the ecological corridor by incorporating all areas above the 1600m contour. These areas, although not under formal protection, are considered relatively secure from land use impacts on account of the low density of adjacent settlement.

The linkage between Royal Natal National Park and Cathedral Peak has been identified as a Provincial Priority Biodiversity Implementation Area (the Upper uThukela Catchment Conservation Area) by MDTP. The linkage is vital in ensuring the integrity of the ecological corridor, but also linking the relatively isolated Royal Natal National Park to other parts of the UDPWHS. The significance of this linkage warrants a formal protected area status. This linkage is coming under increasing pressure from settlement expansion, and its associated environmental impacts. This important linkage was incorporated into the study by integrating into the mapping exercise the community-supported Wilderness Buffer Zone described in the 2007 Integrated Natural and Cultural Heritage Management Plan for the Mountain Areas of the Mnweni Triangle, Busingatha, Obonjaneni and Okhombe (Northern Drakensberg), developed during the course of the Amagugu Esizwe Project. The 1600m contour level was adopted in places where the delineation of this Wilderness Buffer Zone has not been completed.

East-west ecological corridors were developed along the northern boundary of the District and through the Mnweni area (Upper Thukela Corridor CBA) and further inland in the District (Lower Thukela Corridor CBA). The northern boundary east-west corridor represents a relatively intact east-west corridor in the District, whilst the latter two are heavily fragmented, degraded in parts, and under significant threat from adjacent settlement. The Upper Thukela Corridor CBA is also designated as a “Primary Tourism and Recreation Node” (Okhahlamba Municipal Area, 1st Draft Spatial Development Framework). The Upper and Lower Thukela east-west corridors have therefore been designated a CBA, in addition to forming part of the ecological corridor. These ecological corridors are connected to lower lying areas of the District by two north south corridors.

The central north-south corridor is aligned along the N3 Freeway, which incorporates four N3 Corridor Development Nodes, which has the potential to impact on connectivity and porosity.

Corridors were expanded in these areas to take into account potential development, and freeway underpasses were incorporated wherever possible. Both north-south corridors extend across marked biophysical gradients, incorporating ridge lines, existing Protected Areas, private game reserves, important stem rivers, and connecting the complete range of vegetation types in the District. A shortcoming within the District is poor connectivity between these north south corridors.

High altitude boundaries with Lesotho and the Free State were considered to have been accommodated by MDTP planning, and linkages to Sterkfontein Dam Nature Reserve were also catered for in the BSP. The northern boundary of the District adjacent to the Free State has been designated as an ecological corridor, linking down into the District along vegetation corridors. Another important cross-municipal corridor linkage was identified with the Mooi Mpofana Municipality, in order to secure a viable east–west corridor linking the UDPWHS with the remainder of the uThukela District using Highmoor Reserve and surrounds.

5.4.2 River Corridors

Maintaining the remaining natural systems along the main stem rivers was considered critical for ensuring continued delivery of ecosystem services and connectivity required for biodiversity persistence. River corridors comprised all stem rivers and all quinery[6] catchments intersected by these rivers, including stem rivers adjoined by heavily transformed areas.

River corridors were developed along north-south and east-west axes. A shortcoming within the planning domain is the high level of transformation directly adjacent to stem rivers, highlighting the importance of catchment management in the District

[6] [6] Water catchments are classified as follows, from largest to smallest: Primary, Secondary, Tertiary, Quaternary, and Quinery catchments, each are nested within the previous category

5.4.3 Wetlands

All wetlands are essential for maintaining hydrological services, including flow regulation, water purification and preventing sedimentation. Accordingly, a persistence target of 100% of all wetlands was adopted, including a 30m buffer on each wetland to
ensure sustained wetland functioning. The 100 % wetland target is based on wetland functioning to ensure the delivery of ecosystem services goods and services, rather than biodiversity targets.

The majority of wetlands within the District are nested within supporting CBAs and CESAs, with a significant proportion within transformed areas directly adjacent to the Drakensberg.

5.4.4 Ridgeline Corridors

East-west and north-south inter-fluvial ridgeline corridors were developed to include the main climatic, upland-lowland, and altitudinal gradients, which should contribute to ameliorating the potential impacts of climate change on the biota of the region. The spatial extent of these ridgeline corridors was determined by the level of transformation within adjacent areas. East-west ridgeline corridors were limited to relatively high altitude areas on account of adjacent transformation, whilst it was possible for north-south ridgeline corridors to link highland and lower lying areas. These corridors traverse significant biophysical gradients in the district.

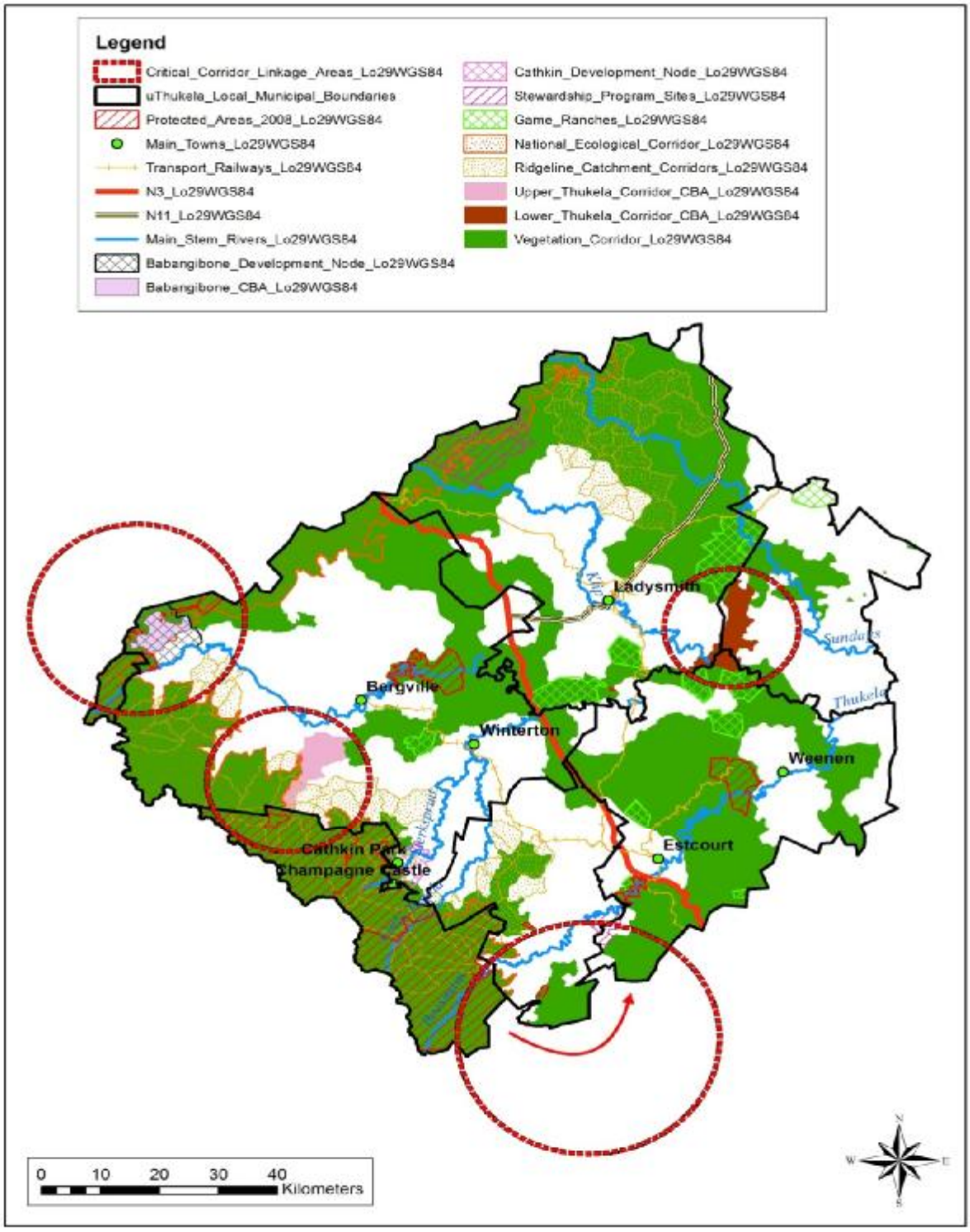
5.4.5 Important Water Yield Areas

The eastern mountain escarpment along the western and northern boundary of the district is part of the country's most critical water yield area (Reyers *et al*., 2005; Schwabe, 1989). A surface of especially important catchments for water yield was provided by EKZNW and incorporated into the BSP.

A large proportion of important water yield areas are located within the linkage between Royal Natal National Park and Cathedral Peak.

5.4.6 Mapping Outputs

The Terrestrial and Aquatic Critical Ecological Support Areas have been illustrated in Figures 17 and 18, respectively.



..Figure 17: Terrestrial Critical Ecological Support Areas

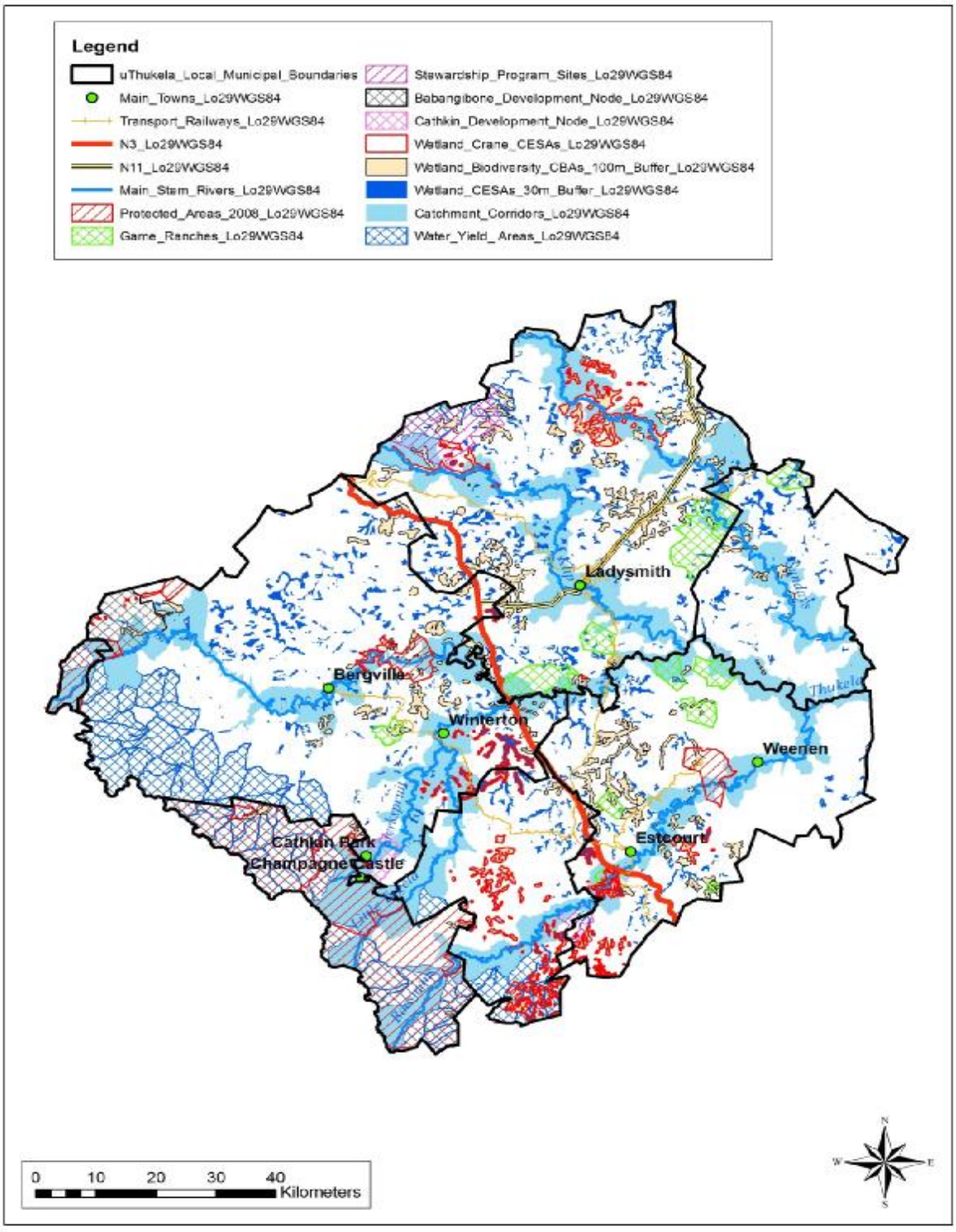


Figure 18: Aquatic Critical Support Areas

6. LAND USE GUIDELINES

Compatible and incompatible land uses and specific management recommendations have been provided for CBAs and CESAs to safeguard critically important natural asset identified in the BSP; cognizance was taken of the SCAP and DAP. It is vital that in addition to the recommended land uses and activities (Table 6), environmental management guidelines are also established (Table 7) to ensure no net loss of natural asset. The following guidelines are proposed measures for the effective management of biodiversity and the components of biodiversity in the region, as required in Section 41(a) of the Biodiversity Act.

Table 6 Framework for Land-Use Planning and Decision-Making Guidelines

Land management objective	Area selection	Appropriate / compatible land uses and activities	Inappropriate / incompatible land uses and activities
Natural[7]	Protected Areas	• Dictated by EKZNW integrated management plan	• Dictated by EKZNW integrated management plan
	Protected Area Buffer (Ian Rushworth & Oscar Mthimkhulu, EKZNW, 2008, unpublished)	• Protected Areas e.g. Proclaimed Private or Community Nature /Game Reserves • Low intensity sustainable[8] naturebased activities e.g. camping, horse riding, rock art trails, wilderness trails, hiking, environmental education, bird-watching, botany trails, swimming, orienteering, fishing, ice/snow climbing, abseiling, sports climbing, mountaineering, mountain biking, etc • Small scale accommodationsupporting eco-tourism e.g. small lodges, campsite, caravan park etc • Agricultural cropping enterprises on existing cultivated lands • Public / private conservation initiatives • Trails (including activities not	• Infrastructural development e.g. public roads, powerlines, water pipelines etc • Urban or industrial development • Extensive tourism and commercial development • Agri-industry • Subdivision of land[9] • Mining and quarries • Afforestation • New agricultural cropping within 2km of • Protected Area boundary • Expansion of existing settlements within 2km of Protected Area boundary • No power lines within 2 km of vulture and crane nesting and feeding sites wherever possible • Impoundments and large scale water abstraction schemes • Aircraft landing facilities • Recreational motor bikes

[7] Ecosystems and species intact and undisturbed; these comprise primarily areas that have institutional restrictions on land use and / or areas that are generally inaccessible

[8] In relation to the use of a biological resource, means the use of such resource in a way and at a rate that would not lead to its long-term decline; would not disrupt the ecological integrity of the ecosystem in which it occurs; and would ensure its continued use to meet the needs and aspirations of present and future generations of people (as per National Environmental Management: Biodiversity Act, No. 10 of 2004).

[9] This relates to the fragmentation of the landscape through subdivision of large farms into smaller less economically viable farms, which results in greater pressure on the remaining natural resources of smaller farming entities. This also relates to indirect impacts such as increased infrastructural development, increased demand for services, fencing, more roads, etc.

Land management objective	Area selection	Appropriate / compatible land uses and activities	Inappropriate / incompatible land uses and activities
		related to the natural resource base e.g. visits to rural homesteads, iZangoma, dancing, traditional food etc) • Permitted hunting	• Cableways • Self-guided 4x4 trails • Introduction of alien fauna e.g. trout • Introduction of alien flora • Aerial application of pesticides • Ribbon development • Any land use or activity significantly impacting on ecological process and impacting on biodiversity attributes identified in CBAs
Near-natural10, ideally Natural Functional11	EKZNW Aquatic Earmarked Catchments EKZNW Irreplaceable Terrestrial Planning Units Vegetation types Floral and faunal priority species Wetland types Proposed Babangibone Development Node CBA Upper Thukela east-west corridor CBA Lower Thukela east-west corridor CBA Critical Ecological Support Areas	• All of the activities permitted in Protected Areas and Protected Area Buffers • Non-proclaimed Private or Community Nature / Game Reserves / Game Farms • Sustainable12 extensive commercial and communal livestock production • Self-guided 4x4 trails (well managed, on existing roads) • Low intensity commercial and tourism development (only in Babangibone Development Node CBA and Upper Thukela east-west corridor) – maintenance of corridors must be ensured	• All of the activities not permitted in Protected Areas and Protected Area Buffers, with the below additions • Cultivation of virgin land • Expansion of existing settlements • New roads into the trail zone (relevance to Babangibone Development Node CBA, Upper Thukela Corridor CBA, and Mnweni Corridor) • Any land use or activity significantly impacting on ecological process and impacting on biodiversity attributes identified in CESAs

• Ecosystems and species largely intact and undisturbed; these comprise primarily current land uses within the municipality that are linked to the natural resource base11 Ecosystems that have been disturbed but are required to maintain basic functionality; individual species may be severely disturbed; these comprise areas that are importantfor the maintenance of ecosystem services and ecological functioning, regardless of the level of disturbance and degradation

Table 7 Framework for Environmental Management within Critical Areas

Critical Biodiversity Areas and Critical Ecological Support Areas	Key objectives	Key management measures
All CBAs and CESAs Including Irreplaceable Areas, Aquatic Earmarked Areas, and Protected Areas - Figures 11 and 16	Conserve relevant biodiversity attribute, prevent ecological degradation, further loss of natural asset, alterations in hydrological regimes, and water pollution	• Alien plant eradication (incl. private and Working for Water) • Wetland rehabilitation (incl. private and Working for Wetlands) • Appropriate burning regimes (incl. private and Working for Fire) • Appropriate livestock and game stocking densities (adhering to agricultural norms) • Sustainable harvesting of biodiversity resources • Reduction in chemicals, nutrients, poisons, bacterial inputs, detergents and other pollutants • Erosion stabilisation and prevention • Provision of meaningful buffers from transformation • Reduction of landscape fragmentation • Rehabilitation of degraded aquatic and terrestrial habitat • Regular area inspections by authorities • Incorporation into Protected Areas Network • Payment for ecosystem services should be explored further • Enforcement of NEMA Duty of Care
Priority faunal species (incl. Crane,	Protect current	• Expansion programmes for priority faunal species

[12] In relation to the use of a biological resource, means the use of such resource in a way and at a rate that would not lead to its long-term decline; would not disrupt the ecological integrity of the ecosystem in which it occurs; and would ensure its continued use to meet the needs and aspirations of present and future generations of people (as per National Environmental Management: Biodiversity Act, No. 10 of 2004).

Oribi, Ground Hornbill, Vultures) CBA - Figures 13 and 14	populations, increase abundance and distribution of animal species	• Maintenance of habitat requirements for faunal species • Protection of nesting and roosting sites • Vultures: protect nesting and roosting sites from any form of disturbance • Quality control of carcasses offered in vulture restaurants • Environmental education re persecution of Vultures and Ground Hornbill • Employ recognised procedures as per Ground Hornbill Working Group and EKZNW • Expansion of Crane Custodian Programme • Employ recognised procedures as per Crane Foundation and EKZNW • Expansion of Oribi Custodian Programme • Employ recognised procedures as per Oribi Working Group and EKZNW • Prevention of poaching • Exclusion of dogs in faunal priority CBAs
Priority floral species CBA vegetation type CBA – Figure 12	Prevent ecological degradation and further loss of vegetation	• Zero tolerance of harvesting • Protection of forest edges from fire • Exclusion of domestic livestock from forests • Maintenance of ecotones
Wetlands, important water yield areas, and stem rivers – Figure 18	Improve biodiversity and hydrological integrity of aquatic systems	• Reinstatement of vegetation cover to 30m from edge of wetland / riparian area if it has been cultivated • Provision of off-stream washing facilities • Upgrade of sanitation facilities in communal areas
Babangibone Development Node CBA and Upper Thukela east-west corridor & Lower Thukela eastwest corridor CBAs – Figures 15 and 17	Prevent ecological degradation and retain connectivity	• All of the above management measures • Establishment of meaningful corridors, prevention of ribbon development

7. COMPETING LAND USES AND ACTIVITIES THAT THREATEN CBAS AND CESAS

7.1 Background

The inclusion of threats in the conservation assessment attempts to reduce potential conflicts between areas selected for conservation and areas with development imperatives and/or vulnerability to degradation. Furthermore, incorporating vulnerability into the assessment allows proactive development of action plans to mitigate threats in priority areas. Threats have been illustrated in Figure 19.

This District contains diverse land uses, to some extent on account of a wide range of land tenure systems, namely state, private and tribal areas. The state land comprises mainly nature conservation areas, predominantly the Ukhahlamba Drakensberg World Heritage Site. The dominant land use in private and tribal lands is commercial and small-scale agriculture, respectively. Most small-scale farmers practise extensive livestock grazing, dry land cropping, and some vegetable gardening, whilst private agricultural operations are large scale, more diverse, more productive, and strongly commercially oriented.

Administrative, industrial and commercial land use is centred on Ladysmith (identified for industrial development in the Provincial Spatial Economic Development Strategy (PSEDS) and, to a lesser extent, Estcourt, which includes a strong agri-processing component. Smaller towns and villages targeted for development include Driefontein, Mhlumayo, Weenen, Colenso, Loskop, Kwadakuza and Winterton. Tourism is focussed on the Drakensberg and the Battlefields routes, as detailed in the PSEDS, primarily impacting areas within development nodes identified in the SCAP (Cathkin Park and Babangibone). Significant development has also been realised in terms of private tourism and residential development in other parts of the Drakensberg.

The relationship between ecosystem integrity and land use is well established and recognition thereof is crucial in the description of the biodiversity profile of an area. Land uses compatible with biodiversity objectives and goals are those under which most biodiversity and associated processes are expected to persist in the long-term. In general, land uses that result in irreversible loss of natural habitat have the highest impact on biodiversity, and land uses that allow for natural habitat to remain largely intact, have a lower impact on biodiversity; the single most important indicator is the

proportional loss of a cover of natural vegetation to some other form of cover. A study by O'Connor and Kuyler (2005), concluded that conservation, livestock or game ranching had the lowest impact on biodiversity integrity and retained substantial natural asset, while that for tourism/recreation was intermediate. All other land uses examined as part of the study (rural settlement, dryland cropping, irrigated cropping, dairy farming, plantation forestry, and urban settlement) had a severe impact.

Impact on biodiversity integrity depended mainly on the extent of transformation and fragmentation, which accounted for the greatest impact on habitats and species, and impairment of landscape functioning. Open-cast coal mining arguably has the greatest impact.

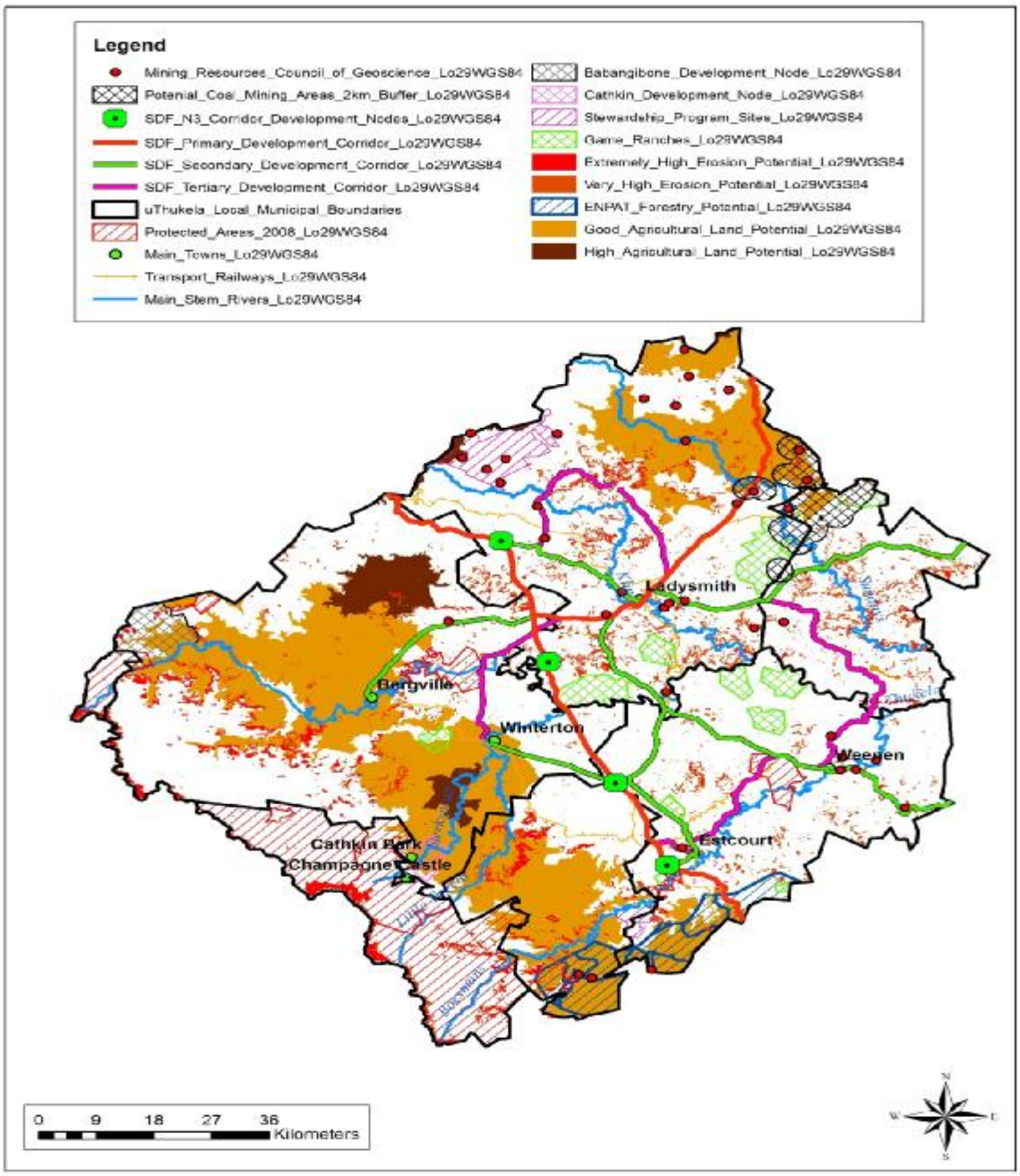


Figure 19: Threats Mapped for the District

7.2 Comparison of Land Uses

The best options for conservation are Protected Areas, within which Wilderness [13] areas tend to retain the highest degree of ecological integrity. However, biodiversity loss can also be expected in Protected Areas on account of insufficient size, adjacent fragmentation and transformation, human impacts, climate change, and nutrient deposition. It is fortuitous that large areas of the Drakensberg were afforded protection on account of its importance for water production, which has also protected its biodiversity value.

Extensive livestock and game ranching based on natural grassland are the next most compatible land uses for biodiversity conservation, provided lands are not overgrazed. The extensive nature of livestock ranching means that poor management, particularly overgrazing and injudicious use of fire, can negatively impact large areas of land. Fire management is a significant determinant of the extent to which the above land use can contribute to biodiversity targets. The grasslands are fire-climax and it is necessary that when fire is applied as a management tool that it be done in way that simulates natural processes. Whilst fire is essential to the system, unfortunately fire is generally applied at too frequent intervals (annually) to encourage a "spring flush". Negative impacts are exacerbated where grazing is applied shortly after burning at intensive stocking rates. Unfortunately due to the seasonal palatability of the grasslands in the uThukela District Municipality this is a common management strategy for both commercial and subsistence farmers. This practice has resulted in a loss of biodiversity, significant loss of basal cover, increased soil loss through sheet and gully erosion and an increase in the occurrence and spread of alien invasive vegetation.

This translates into a negative impact on catchment integrity; stream flow in the dry season may be reduced or may cease to flow, summer flows may be exacerbated leading to flooding, soil erosion increases, veld productivity is reduced, seasonal water scarcity, poorer water quality and increased water vulnerability. In addition, the life span of water storage and abstraction infrastructure is seriously reduced through sedimentation (e.g. Woodstock Dam).

[13]Wilderness Area: Means "an area designated for the purpose of retaining an intrinsically wild appearance and character, or capable of being restored to such and which is undeveloped and roadless, without permanent improvements or human habitation" as defined by the National Environmental Management: Protected Areas Act No. 57 of 2003.

With 98% of surface waters in South Africa already allocated to users, the adoption of new supply enhancement strategies is urgent 14.

Whilst population growth in the District is estimated to be negative (IDP, 2008/2009 Review), rural settlements are expanding and are characterised by an ever increasing urban constituent. Concomitantly, multiple livelihood strategies are common, integrating informal economic activities with traditional dependency on natural resources. Dependency on natural resources of the region by most rural communities is an issue of concern.

[14] The payment for ecosystem services supplied by mountain communities has been mooted as a feasible option for supply augmentation("Payment for ecosystem services: Results of recent research in the Maloti Drakensberg", Myles Mander, Futureworks). There aresignificant benefits to be gained by both local ecosystem services producers (the mountain communities) and by the broader user orcatchment community in implementing a payment for ecosystem services system.

The unnaturally high concentration of people in rural areas, coupled with the expansive nature of settlement and poor land management practices, has resulted in significant degradation of natural resources. Over-grazing, injudicious burning regimes, sheet and donga erosion, unsustainable harvesting of plants, hunting of wildlife, and the spread of alien invasive plants have been the primary causes of degradation. Stock theft has indirectly increased land transformation in commercial areas through a shift from livestock ranching to more risk-averse agricultural activities such as crop production.

The relationship between crop production and biodiversity conservation is largely negative. If such activities have occurred in an area, then that area was considered unsuitable for meeting conservation goals. Grassland or savanna biodiversity does not recover from transformation to pastures, croplands, or timber plantations once these land uses are abandoned. Current cropland, pastures and commercial forestry were represented as transformed areas in the BSP.
These land uses, especially commercial afforestation, impact negatively on porosity (the ease with which organisms can move through the landscape), connectivity and water resources. In terms of water resources, irrigation practises in agricultural production generally increase water use and chemical inputs into the environment. Where natural grasslands have been converted to intensive and irrigated pastures biodiversity loss is comparable with crop production. Dairy farming is particularly detrimental to biodiversity integrity in this region on account of large scale land transformation, dependence on irrigation, chemical inputs, intensive cropping for winter feed, and bacterial and nutrient inputs resulting from high animal numbers. However, well managed agricultural areas have the potential to contribute to the delivery of some ecosystem services, although at a reduced rate in comparison with natural conditions.

Land transformed to urban use inherently experiences the greatest loss in biodiversity integrity through direct loss of natural asset, increased demands on natural resources, increases in pollution, and negative impacts on ecosystem processes. Potential future areas of development and settlement were identified in the SDF of the municipality's IDP, and the Provincial Spatial Economic Development Strategy.

The District has experienced significant pressure in terms of private tourism and residential development in the approaches to the Drakensberg. The KZNTA Tourism Product Development Strategy (2002) identified the Ukhahlamba- Drakensberg World Heritage Site as a Primary Node for

tourism development within what has been termed the Thukela Gateway. One of the recommended projects emanating from the strategy considers the Mnweni Valley, which initially included a viability exercise for a cableway and a Development Masterplan for the Mnweni Valley. This area falls into the Okhahlamba Local Municipality, and comprises one of the 50 most deprived areas in KZN (PSEDS), highlighting the importance of local economic development. Whilst the community-oriented element of the Mnweni Project is in progression, the cableway project appears to have been put in abeyance. With regards to the Mnweni Valley Projects, the Mnweni Cultural and Hiking Centre has been constructed in the valley. The project is ongoing and an Integrated Natural and Cultural Heritage Management Plan are in the process of being completed. The delineation of a Wilderness Buffer Zone beyond which conservation compatible land uses should prevail is well advanced, with the only remaining gap comprising a relatively short section leading up to Cathedral Peak. Any activities within the Mnweni Valley and Wilderness Buffer Zone are anticipated to comprise conservation-friendly development.

Over the past ten to twenty years there has been a proliferation of up-market housing estate developments that are often associated with fly-fishing, golf and / or equestrian activities.
This trend is country wide in South Africa, and it has begun to emerge in increasing measure within the Drakensberg and its approaches whilst the rest of the uThukela District Municipality has remained largely undeveloped. Development has been focussed on the Cathkin Park Development Node and the Babangibone Development Node to a lesser extent, although development has also sporadically breached outside of these nodes. Land restitution has resulted in the transformation of many agricultural properties into rural settlement areas.

Roads impact on biodiversity through direct transformation, associated infrastructural impacts, and human activity, and have an effect on connectivity and porosity that is disproportionate to the area transformed. Roads also often result in ribbon development on account of improved accessibility.

Recognising coal as a critical national resource for power generation, is was assumed that existing mines and potential mining areas have a high probability that they will eventually be mined. Coal mining is highly invasive, especially open cast mining as is practised in KZN.

All coal seams plus a 2 km buffer (determined by EKZNW research) were therefore represented as threats and avoided wherever possible. If a coal seam plus buffer intersected an area that was critical for meeting a vegetation target, a mandatory conservation area, or an essential corridor, then the vegetation has been represented with the implication that such areas should not be mined. Note that the buffer accommodates only the direct impacts of coal mining and not the indirect impacts such as acid mine drainage.

7.3 Alien Plants

Apart from directly impacting on the integrity of habitat for indigenous biota, alien invasive plants can alter ecosystem functioning, substantially reduce the productive value of land, and significantly impact hydrological functioning depending on the scale of the invasion and the type of alien species. Alien infestations may result in marked declines in stream flow; transformation of vegetation composition and structure; local extirpation of individual plant or animal species or plant communities; alteration of patterns of nutrient cycling and fire regime; accelerated soil erosion; and rendering areas less accessible to management. In terms of livelihoods, invasive alien plants may impact on tourism and agricultural production. Alien trees frequently disrupt tourism view-sheds, and dense bramble may block access paths. This loss of productive land to alien plant invasions is a significant concern as it often results in increasing pressure and degradation on remaining land that may promote further invasion of alien plants. . In many cases, the cost of clearing a dense infestation exceeds the value of the land, resulting in significant management costs that need to be borne by the landowner thus reducing profit margins (in commercial ventures) or increasing the vulnerability of the rural poor. There is however, an opportunity for contributions to rural livelihoods through employment opportunities in eradication operations, as well as the beneficiation of some species as they provide materials for the production of various household and saleable items such as building material, fuel wood, crafts and furniture.

The lowlands of the district extending into the foothills of the Drakensberg are threatened by expanding infestations of various invasive alien plant species. Spread of common alien species such as black wattle (*Acacia mearnsii*), gum (*Eucalyptus spp.*) and pine (*Pinus spp.*) is partly controlled by clearing programmes such as Working for Water and private efforts prompted by legislation,

others such as American bramble (*Rubus cuneifolia*) are less successful. A number of emerging alien species are not yet obvious nor well-known in terms of current distribution, rate of spread, or impact. The threat from alien plant species is lower in the eastern parts of the municipality where moisture is a limiting factor and invasive alien plant species are generally restricted to hardier drought tolerant species, such as *Opuntia* species. However, riparian areas remain particularly vulnerable, with *Melia azederach* and *Salix fragilis* posing a significant threat.

7.4 Soil Erosion Potential

Soil erosion negatively impacts on ecosystem integrity through habitat degradation and suboptimal ecosystem services. The ARC Potential Soil Erosion Map (Le Roux, 2008) was used to identify areas of high erosion potential. High erosion areas were avoided where possible.

7.5 Threats Not Addressed

The spatial distribution of threats has some limitations due to lack of available data, and it was not possible to assess all threats, as follows:

- Although communal livestock grazing is a dominant land use in parts of the District, it was not possible to spatially represent grazing impacts across the project area due to a lack of reliable data on cattle numbers and grazing areas.
- The proposed new N3 route could not be investigated because no final choice of the five alternative routes has been made by the National Department of Transport. This potential threat to the District must be included in the next revision, if a route has been finalised.
- Another threat that could not be spatially assessed but nevertheless merits close attention is the indirect impact of stock theft through changes from beef-farming to intensive cropping or afforestation as a consequence of significant financial losses. This has the potential to render areas currently suitable for meeting conservation targets incompatible in the future.
- The spread of invasive alien plants was also not assessed.

8. CONCLUSIONS

The final configuration of areas, as illustrated in consolidated format in Figures 20 and 21, highlighted a number of issues and achieved the following major biodiversity objectives:

(i) Conservation targets could mostly be met in the District but the remaining amount of natural asset offered few choices in meeting these targets, primarily on account of large scale transformation and land use threats. Appendix 6 illustrates the small number of additional areas that are not critical to achieving biodiversity targets.

(ii) Area selection within the foothills of the Drakensberg was constrained by extensive land transformation, comprising expanding settlement and commercial agricultural enterprises. This restricted opportunities for ensuring regional connectivity (both terrestrial and aquatic), particularly east-west linkages, inferring high management requirements in order to ensure persistence of sub-optimal linkages.

(iii) Conservation targets for all identified biodiversity features were accommodated, with the exception of Income Sandy Grassland. Additional areas will have to be identified in adjacent municipalities to account for this shortfall in vegetation areas. Any further loss of Glencoe Moist Grassland has the potential to result in a failure to achieve conservation targets for this vegetation type.

(iv) The north-east corner and southern boundary of the District are arguably the most critical biodiversity areas for immediate conservation action in the study area.

(v) The spatial configuration of CBAs has achieved connectivity across the entire biophysical and altitudinal gradient of the District, and was successful in incorporating the majority of Sites of Conservation Significance, Living Cultural Heritage Sites15, Game Farms, and critical areas as identified by the EKZNW conservation plan. It also allows for opportunity for meeting protected area expansion targets within areas identified by the EKZNW Protected Areas Expansion Programme and Stewardship Programme.

(vi) The spatial distribution of Protected Areas in the District is not adequately aligned across biophysical gradients, and is distorted in favour of upland areas.

(vii) Coal mining, high potential agricultural land, potential forestry areas, and areas likely to experience settlement expansion, pose the greatest threats to identified CBAs.

(viii) Large scale land transformation attributed to communal and agricultural land use is negatively impinging on the integrity of riparian areas. Upper catchment wetlands within transformed areas directly adjacent to the Drakensberg are isolated and less likely to receive appropriate conservation attention.

(ix) The size and positioning of water impoundments related to water transfer schemes has severely impacted on hydrological functioning.

(x) The Babangibone CBA is critical to the protection of a number of montane endemics and the persistence of regional ecological processes, including high water yield, ecological corridors, and regional connectivity.

(xi) The spatial configuration of CESAs is in support of identified CBAs. However, the corridor area between Royal Natal National Park and Cathedral Peak, the Upper Thukela CBA, the Lower Thukela CBA, and N3 constrictions adjacent to Corridor Development Nodes, represent high risk linkages on account of fragmentation and land use threats.

(xii) Apart from the east-west linkage along the northern boundary of the District, the southern boundary of the District in conjunction with natural asset in the Mooi Mpofana Municipality offers the next best opportunity for a meaningful east-west corridor linkage.

(xiii) The upper catchment area between Royal Natal National Park and Cathedral Peak is a priority as it is still relatively intact due to remoteness and a lower density of settlement. The focus in this area should be to implement management measures to conserve what is left in reasonable condition. It is also critical that this linkage is afforded a secure land use, on account of its biodiversity importance in terms of corridor function, water yield, protected area expansion, and aquatic and terrestrial biodiversity features.

(xiv) The District provides a critical ecosystem service in terms of water provision and carbon sequestration.

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[15] Incorporation of Living Cultural Heritage Sites, wherever possible, provides additional motivation for the preservation of critically important natural asset.

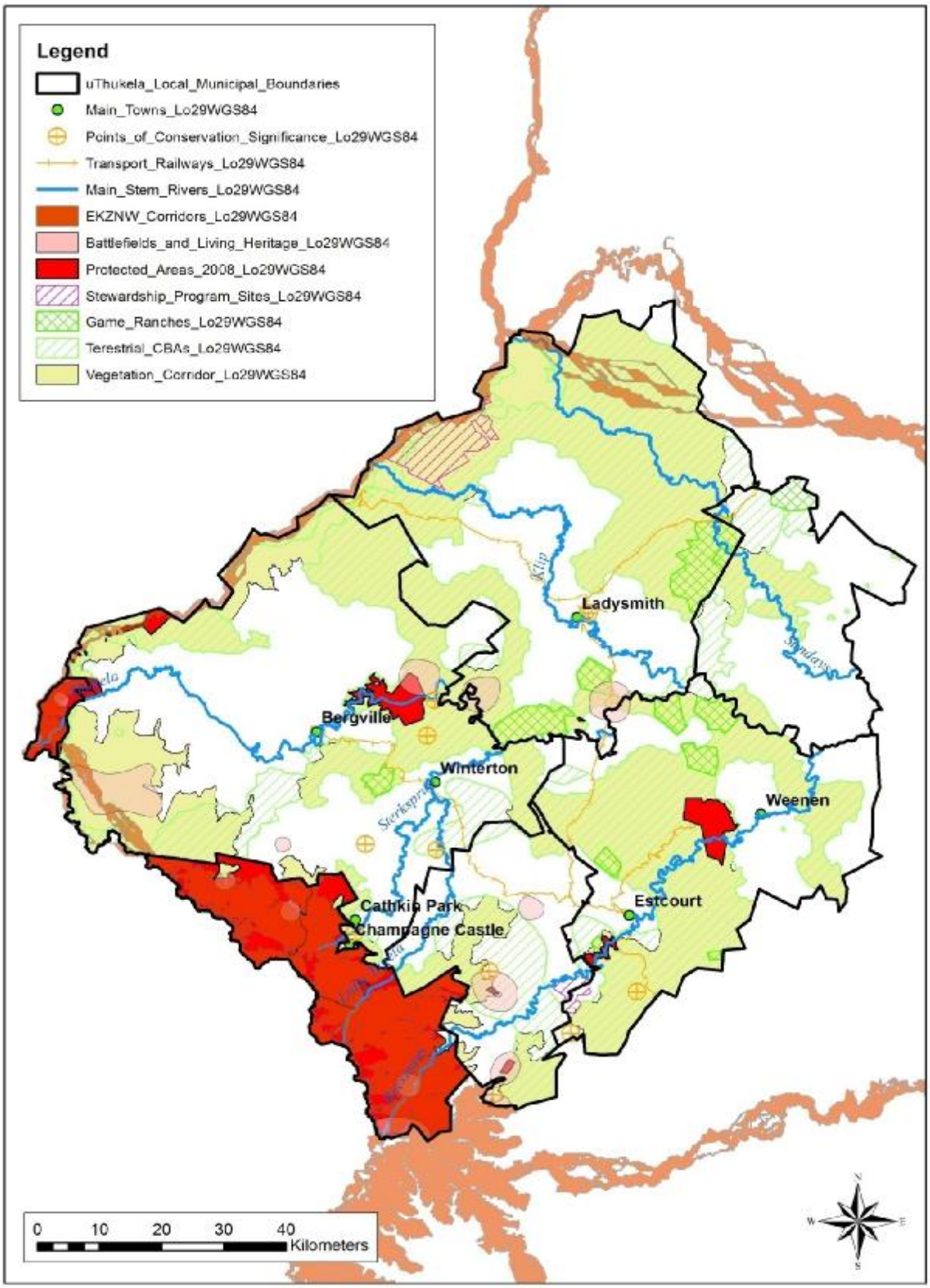

Figure 20: Terrestrial Consolidated Map

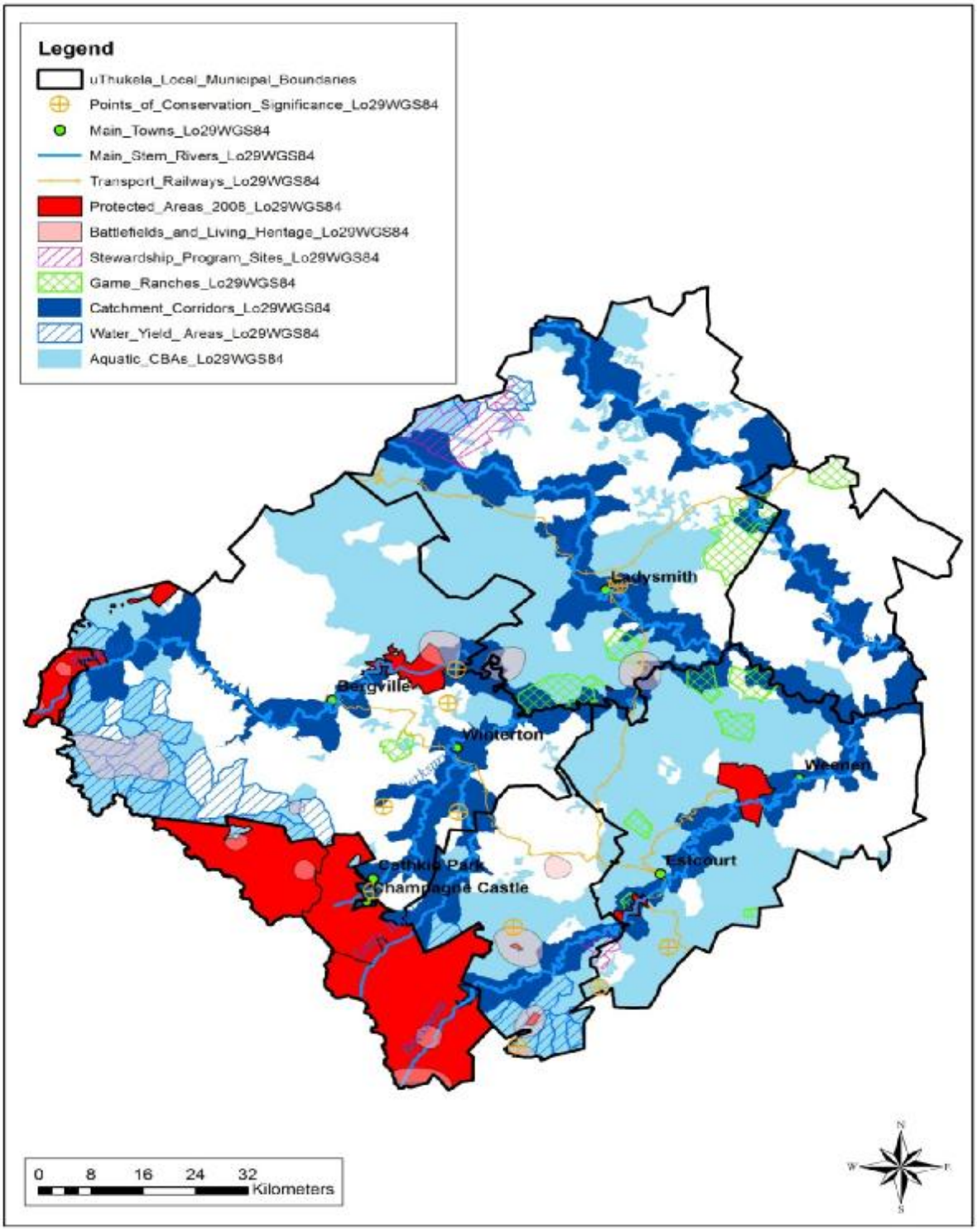

Figure 21: Aquatic Consolidated Map

9. RECOMMENDATIONS

The following is essential to achieving biodiversity targets in the long term:

(i) Conservation efforts must be focussed on CBAs and CESAs identified within the BSP, focussing on 'at risk' areas, considering the most important areas for conservation. In order to create a conservation management priority map, biodiversity features were firstly ranked according to their perceived biodiversity significance, where after each specific ranking was assigned a value (Classification) and an intersect analysis was performed. The classification values from all layers within the intersecting areas were then summed, and from this output it was possible to identify priority areas for conservation management according to the values of the summed classifications. The Provincial CPlan Irreplaceable Areas and Aquatic Plan Earmarked Areas were ranked highest, followed by the various CBAs, and finally corridor CESAs under threat (designated as CBAs). This exercise highlighted a number of key focus areas (red – highest priority, dark green – lower priority), illustrated in Figure 22.

Ezemvelo KZN Wildlife should increase their presence in these areas through regular monitoring and interaction with landowners, and management inputs should focus on controlling further land transformation and degradation.

(ii) Development threats, particularly from areas designated for development (Babangibone Development Node, Cathkin Park Development Node, N3 Corridor Development Nodes, Primary Tourism and Recreation Node and other tourism development corridors) and as a consequence of rural settlement expansion (particularly around and to the north of Ladysmith, and the Drakensberg Foothills), must be addressed at a strategic planning level to ensure that development does not take place at the expense of critical biodiversity asset.

(iii) Land use and environmental management guidelines provided in the BSP must be integrated into multi-sectoral planning, including EKZNW conservation programmes, the municipal Integrated Development Plan and Spatial Development Plan, and the

Provincial Spatial Economic Development strategy; this should be monitored by EKZNW.

(iii) Water quality management is essential in the Aquatic Critical Ecological Support Areas, Wetland CBA and the Earmarked Aquatic Planning Units. Management actions should focus on reducing soil erosion and chemical and microbial inputs, and the management of associated terrestrial vegetation to ensure sustained inflow of clean water.

(v) Opportunities for conservation-oriented local economic development must be explored within CBAs, particularly within areas adjacent to Protected Areas, and areas earmarked for the Stewardship and Protected Areas Expansion Programmes, keeping in mind the need to secure land within formal conservation land use across the entire biophysical gradient. Conservation land use must be investigated as a tool for economic empowerment of local communities.

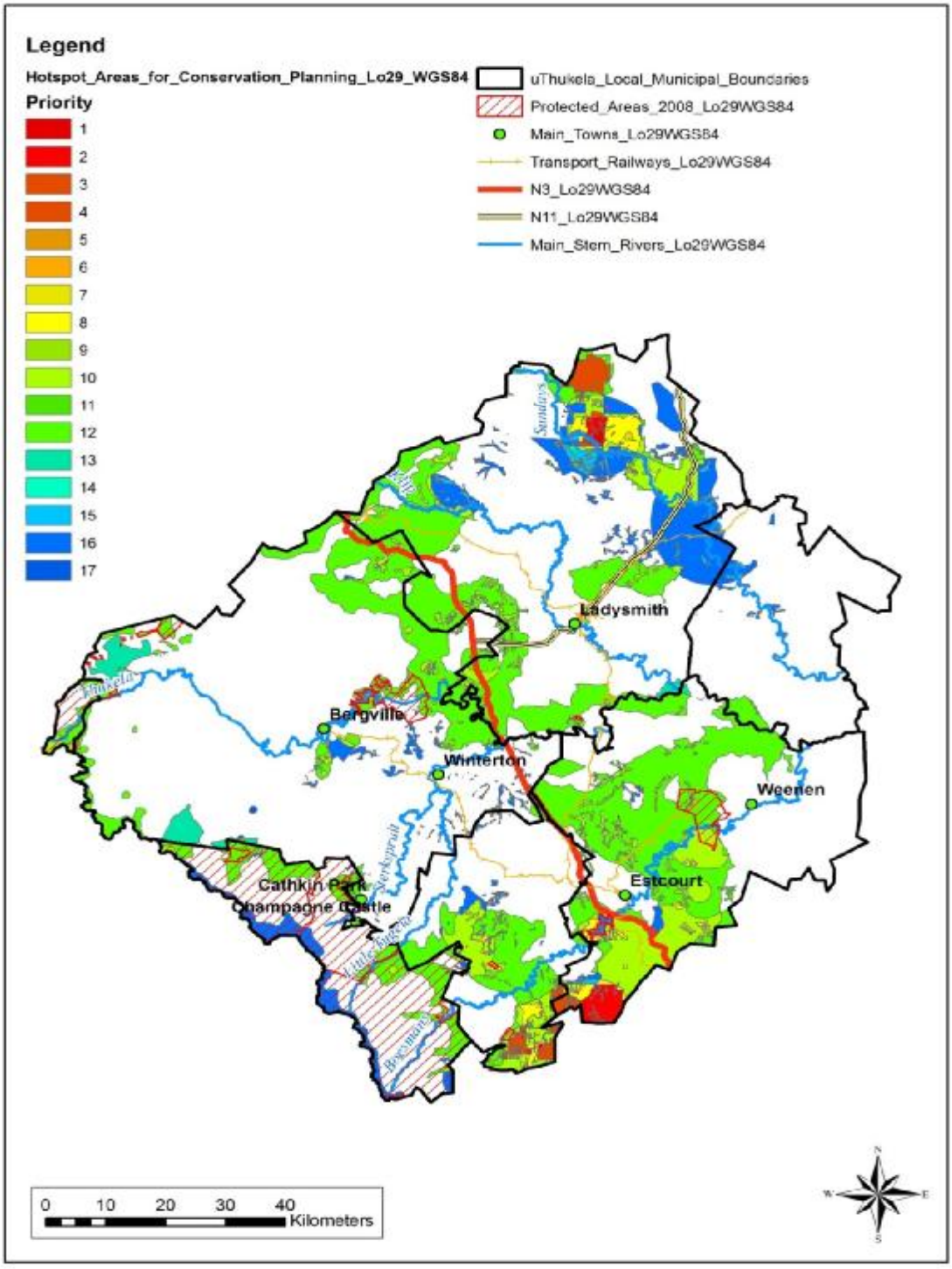

Figure 22: Key Conservation Focus Area

(vi) The north-east and south-west corners of the District, the linkages between low-lying Protected Areas, and the linkage between Royal Natal National Park and Cathedral Peak, are highlighted as focus areas for formal conservation land uses. Ezemvelo KZN Wildlife should continue to provide biodiversity advice into the current buffer demarcation process managed by the Wilderness Group and local communities in the Royal Natal National Park – Cathedral Peak corridor, linking this to the work being carried out by Rushworth and Oscar Mthimkhulu (2008).

(vii) The ecological linkage identified on the interface between the District and the Mooi Mpofana Municipality and Free State (specifically the Sterkfontein linkage) must be taken into account in conservation planning in the Umgungundlovu District.

(viii) The shortfall in Income Sandy Grassland must be negotiated with adjacent municipalities, specifically the Amajuba, Umzinyathi and Zululand District Municipalities, in order to achieve targets. Any activity that could result in a further loss of Income Sandy Grassland and Glencoe Moist Grassland must be critically evaluated.

(ix) Payment for ecosystem services should be explored by EKZNW in conjunction with private land owners and local communities, emphasizing potential socio-economic benefits.

(x) Additional water impoundments should not be permitted within the District.

(xi) The EKZNW CPlan should be re-run at the District level, based on any new data, and biodiversity targets scaled to the District Level. Planning Units would then better reflect the municipal context at a finer-scale, based on the best realistic conservation options in the landscape. This is considered a critical task as a consequence of rapidly retreating options in the District.

(xii) The BSP should be updated regularly within EKZNW, based on a monitoring programme and the most recent land cover data available, to inform decision making within the planning department and other relevant EKZNW structures. Multi-sectoral reporting should at a minimum coincide with the municipal Integrated Development Plan and Land Use Management System review cycle, comprising a minimum 5-year cycle.

(xiii) Not all of the “Inappropriate / incompatible land uses and activities” provided in the Land Use Guidelines require environmental authorisation in terms of the NEMA Environmental Impact Assessment Regulations (2006), and therefore would not be

subject to any environmental authorisation process. The BSP, apart from being the precursor to a Bioregional Plan, provides an opportunity for the competent authority to initiate an Environmental Management

Framework for the District, adopting the CBAs and CESAs as Geographical Areas within an Environmental Management Framework. A key outcome of an EMF is the re-evaluation of the applicability of scheduled Listed Activities in terms of NEMA, whereby Listed Activities may be amended or additional activities may be promulgated in sensitive areas; the EMF therefore provides an opportunity for ensuring that critically important biodiversity is adequately considered in authorisation processes.

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11. APPENDICES

Appendix 1 Diversity in Vegetation Units Relevant to the uThukela District Municipality (please consult Mucina & Rutherford, 2006, for additional detail referred to below)

Vegetation unit	Altitudinal Range	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
Glencoe Moist Grassland	This vegetation type is classified as KwaZulu-Natal Moist Grassland in Mucina and Rutherford (2006). It is expected that Glencoe Moist Grassland will be recognised as a discrete vegetation type by Mucina & Rutherford in the next iteration of vegetation classification.				
Income Sandy Grassland	880 - 1 340m (mainly 1 120 - 1 240m).	Very flat extensive areas with generally shallow, poorly drained, sandy soils supporting low, tussock—dominated sourveld forming a mosaic with wooded grasslands (with *Acacia sieberiana* var. *woodii)* and on well-drained sites with the trees A. *karroo, A. nilotica, A. caffra* and *Diospyros lycioides*. On disturbed sites *A. sieberiana* var. *woodii* can form sparse woodlands. *Aristida congesta*, *Cynodon dactylon* and *Microchloa caffra* are common on shallow soils (Camp 1999c)	Sandstones and shale of the Madzaringwe Formation (Ecca Group of Karoo Supergroup) supporting poorly drained sandy soils, mostly of the Glenrosa form. Most important land types Ca, Bb and Fb.	Region of summer rainfall, with most precipitation occurring between October and March (overall MAP 750mm; range 650 - 800mm), much of which falls as thundershowers often accompanied by hail. MAT is just below 17°C, and mean annual evaporation 1 845mm. Frost moderate (Camp 1999c). See also climate diagram for Gs 7 Income Sandy Grassland	None noted in Mucina &Rutherford
Mooi River Highland Grassland	340 - 1 620m	Mainly rolling and partly broken landscape, covered in grassland dominated by short bunch grasses. *Heteropogon contortus*, *Themeda triandra* and *Tristachya leucothrix* are dominant in well-managed veld.	A mosaic of generally shallow and poorly drained soils derived from sedimentary rocks, mostly of the Adelaide Subgroup (Beaufort Group) of the Karoo Sequence. Deep well drained apedal soils of the intrusive igneous rocks of the Karoo Dolerite Suite also occur	The region has a MAP of 785 mm, falling mostly in summer. Mist and snow are not frequent. Overall MAT is slightly higher than 14$_{o}$C. Light, but relatively frequent (30 days per year) frosts may occur for six months in the year (Camp 1999b). See also climate diagram for Gs 8 Moor River Highland Grassland	None noted in Mucina & Rutherford

Vegetation unit	Altitudinal Range	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
			Almost half of the area is classified as Ac land type, followed by Bb and to lesser extent also Fa.		
Thukela Valley Bushveld	350 - 1000m	Often rocky rugged slopes and terraces mainly with deciduous trees of short to medium height (and many large shrubs) including *Acacia tortilis* *Acacia nilotica* and *A. natalitia* and prominent evergreen species such as *Olea europaea* subsp. *africana*, *Boscia albitrunca* and *Euclea crispa* in places. Succulent plants, mainly species of Euphorbia and *Aloe* occur on shallow and eroded soils. Relatively limited areas are dominated by succulents such as *E. tirucalli* (some hill-sides south of the Thukela) and *E. ingens* on steep slopes, but also commonly on the valley floor.	Shallow soils of Mispah and Glenrosa forms on the slopes, while in valley bottoms, pockets of deep alluvial soils as well as calcareous, duplex soils are found. The major geological formations are sediments of Ecca Group (Karoo Supergroup) and in the eastern part also Archaean granites. Land types mainly Fc and Fb, with some Ae and Ea	Summer rainfall with dry winters. MAP about 500 850mm. Frost fairly infrequent and usually on valley bottoms. Mean monthly maximum and minimum temperatures for Muden 36.7°C and 0.2°C and for Weenen 38.1°C and - 4.4°C both for December and June, respectively. See also climate diagram for SVs 1 Thukela Valley Bushveld.	**Endemic Taxa** Small Tree: *Encephalartos cerinus*. Tall Shrub: *Gymnosporia macrocarpa*. Low Shrubs: *Blepharis natalensis* (d), *Barleria argillicola*. Succulent Shrub: *Euphorbia pseudocactus* (d). Succulent Herb: *Gasteria tukhelensis*. Succulent Herbaceous Climber: *Ceropegia cycniflora*. **Biogeographically Important Taxa** (Thukela Basin endemics) Small Tree: *Vitellariopsis dispar*. Succulent Herbs: *Aloe prinslooi, Orbea woodii*. **Remarks** Very steep and exposed (weIl-insolated and dry) rocky habitats support succulent flora including, for example, *Aloe rupestris* and *A. mudenensis*
Drakensberg Foothill Moist Grassland	880 - 1 860m	Moderately rolling and mountainous, much incised by river gorges of drier vegetation types and by forest, and covered in forb-rich grassland dominated by short bunch grasses including *Themeda triandra* and *Tristachya leucothrix*	Geology is dominated by mudstones and sandstones of the Tarkastad Subgroup and the Molteno Formation (Karoo Supergroup) as well as intrusive dolerites of Jurassic age. The	Summer rainfall, with MAP almost 890mm. MAT of 14.6°C and 26 frost days per year are indicative of a cooler, submontane form of warm temperate climate. See also the climate diagram Gs 10 Drakensberg Foothill Moist	**Endemic Taxa** Herbs: *Alchemilla incurvata*, *Argyrolobium sericosemium*, *Diascia esterhuyseniae*, *Stachys rivularis*. Geophytic Herbs; *Brachystelma molaventi*, *Dioscorea brownii*, *Ornithogalum baurii*. Succulent Shrub: *Delosperma wiunii*.

Vegetation unit	Altitudinal Range	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
			dominant soils on the sedimentary parent material are well drained, with a depth of more than 800mm and clay content from 15-55%, representing soil forms such as Hutton, Clovelly Griffin and Oatsdale. On the volcanic parent material (dolerite) the soils are represented by forms such as Balmoral, Shortlands and Vimy. Most common land typesAc and Fa.	Grassland	**Biogeographically Important Taxa** (Drakensberg endemics, and Drakensberg endemics extending to Griqualand East) Geophytic Herb: *Schizochilus bulbinella*. Graminoid: *Schoenoxiphium burrtii* **Remarks** Due to the considerable concentration of local endemics as well as Drakensberg endemics, this unit might be reclassified as a Gd grassland unit after detailed analysis and its area included within the realm of the Drakensberg Alpine CE.
KwaZulu-Natal Highland Thornveld	920 -1 440m.	Hilly, undulating landscapes and broad valleys supporting tall tussock grassland usually dominated by *Hyparrhenia hirta*, with occasional savannoid woodlands with scattered *Acacia sieberiana* var. *woodii* and in small pockets also with *A. karroo* and *A. nilotica*. where It occurs on both dry valleys and moist upland.	A variety of Karoo Supergroup rocks occur in the area, including the Dwyka, Ecca and Beaufort Groups and marginally also Jurassic dolerite intrusions. Yellow-brown soils over plinthic subsoil andshallow duplex soils are common. Red and black heavy soils are derived from dolerites and showhigh resistance to erosion. The unit falls within various land types, including Ca, Eb, Fa, Db and Bb.	Summer rainfall. MAP about 750mm (79 rain days per year; Camp 1999c). The midwinter months of June and July have 2.6 rain days on average. Much of the summer precipitation comes in form of thunderstorms (63 and 56 thunderstorm days per year for Ladysmith and Estcourt, respectively). Mist is uncommon (14 days of mist per year for both Ladysmith and Estcourt). MAT 15.6—19.0°C (overall average 16.5°C). Summers are warm to hot, winters are cool. There are 15 frost days per year. The mean annual evaporation recorded at Estcourt is 1 725mm, while the range for the entire vegetation	**Endemic Taxa** Low Shrub: *Barleria greenii.* Succulent Shrub: *Aloe gerstneri.* Succulent Herb: *Aloe inconspicua*

Vegetation unit	Altitudinal Range	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
				unit is 1 706 - 1 918mm (Camp 1999c), the overall average 1 830mm. See also climate diagram for Gs 6 KwaZulu-Natal Highland Thornveld	
Northern KwaZulu-Natal Mistbelt Forest	Most of the patches occur in an altitudinal belt spanning 1 050 - 650m.	Tall, evergreen afrotemperate mistbelt forests occurring primarily in east-facing fire refugia such as subridge scarps and moist sheltered kloofs where they form small, fragmented patches The most common canopy trees include *Xymalos monospora*, *Podocarpus latifolius*, *Combreturn kraussii*, *Cryptocarya transvaalensis*, *Schefflera umbellifera*, *Syzigium gerrardii*, *Olea capensis* subsp *macrocarpa*, *Psydrax obovata* subsp. *elliptica*, *Pterocelastrus galpinii*. In the understorey *Psychotria zombamontana*, *Canthium kuntzeanum*, *Gymnospori harveyana*, *Peddiea africana*, *Pavetta inandensis*, *Mackaya bella*, *Sclerochiton harveyanus* etc. are found. The herb layer supports a number of dominating *Acanthaceae* (*lsoglossa*), *Lamiaceae* (*Plectranthus, Stachys*) and *Rubiaceae* (*Galopina*) herbs and so called 'soft shrubs', geophytic herbs and ferns (*Asplenium Dryopteris*, *Polystichum*). Of lianas and climbers *Dalbergia armata*, *Combretum edwardsii*, *Jasminum abyssinicum*, *Rhoicissus rhomboidea* and *Keetia gueinzii* are the most conspicuous vines, as is the scandent grass	Highly weathered, clayey soils mainly of Avalon and Hutton soil forms, derived from shales (Pretoria Group), quartzite (Black Reef Formation), dolomite (Chuniespoort Group), granite (Nelspruit Basement) and diabase (Mokolian intrusives).	These forests border on sourveld grasslands on their upper boundary, whereas they often border on bushveld on their lower boundary. Climate is thereforevariable, with cooler sheltered areas and fire refugia providing suitable habitat.	
Vegetation unit	**Altitudinal Range**	**Vegetation and Landscape Features**	**Geology and Soils**	**Climate**	**Endemic taxa / Biogeographically important taxa / Remarks**
					also Biogeographic-evolutionary) link of these forests to the Scarp Forests

Northern KwaZulu-Natal Moist Grassland	1 040 - 1 440m.	Hilly and rolling landscapes supporting tall tussock grassland usually dominated by Themeda triandra and Hyparrhenia hirta. Open Acacia sieberiana var. woodii savannoid woodlands encroach up the valleys, usually on disturbed (strongly eroded) sites	Mudstones, sandstones and shales of the Beaufort and Ecca Groups of the Karoo Supergroup predominate and are intruded by dolerites of Jurassic age. Land types Bb, Ac, Fa and Ca.	Summer rainfall, with overall MAP of 840mm (710- 1 120 mm;Camp 1999a), mainly as summer thunderstorms. Mist occurs frequently on hilltops in spring and early summer but summer droughts are also frequent. Summers are warm to hot, with maximum temperature recorded in the hottest month of January (Bergville MAT 27.8°C). MAT is around 16°C, but some localities may reach 17°C. Frosts are severe and occur about 20 days per year. Mean annual evaporation recorded at Bergville is 1 895mm. See also climate diagram for Gs 4 Northern KwaZulu-Natal Moist Grassland.	**Biogeographically Important Taxa** (both Low Escarpment endemics) Succulent Herb: *Aloe modesta*. Low Shrub: *Bowkeria citrina*.
Thukela Thornveld	900 - 1 300m.	The dominant landscape features are valley slopes to undulating hills. Vegetation is Acacia- dominated bushveld of variable density (ranging from wooded grassland to dense thickets) with dense grassy undergrowth.	Broad variety of soils ranging from vertisols and solodised solonetzic soils to transitional fersiallitic soils (Edwards 1967) developing over Karoo Supergroup sediments of the Beaufort and Ecca Groups). Heavy soils are developed over Jurassic doleritei ntrusions forming koppies and sills. Land	Summer rainfall with dry summers. l\/IAP about 550-850 mm. Frost fairly infrequent, occurring mainly on the flats. Mean monthly maximum and minimum temperatures for Ladysmith 36.1°C and - 3.6°C for January and July, respectively. Corresponding values for Estcourt-TNK 34.5°C and - 2.3°C for January and June, respectively. See also climate diagram for SVs 2 Thukela	**Endemic Taxon** Small Tree; *Encephalartos msinganus*. **Biogeographically Important Taxa** (Thukela Basin endemics) Small Tree: *Vitellariopsis dispar*. Succulent Herbs: *Aloe prinslooi, Orbea woodii.*

Vegetation unit	**Altitudinal Range**	**Vegetation and Landscape Features**	**Geology and Soils**	**Climate**	**Endemic taxa / Biogeographically important taxa / Remarks**
			types Fb, Fa, Db, Ea, Ec and Dc.	Thornveld	

Drakensberg Afroalpine Heathland	Altitude range 2 900 - 3 400m, mainly 2 980 - 3 110m.	Rolling plateaus with steep slopes in places. Very variable but short vegetation from shrub-dominated areas, for example by ***Helichrysum trilineatum***, to grassland with shrubs, to grassland with few shrubs. The most dominant grass is ***Merxmuellera disticha*** (Herbst 1971, Herbst & Roberts 1974b, Morris et al. 1993). Cushion plants (e.g. ***H. sessilioides)*** and plants forming low mats (e.g. ***H. praecurrens)*** are common. As elsewhere in the highlands of Lesotho, ***Chrysocoma ciliata*** is common in disturbed areas and even in some apparently little disturbed areas. Many Lesotho Mires are embedded in this unit. The medium-tall grass ***M. drakensbergensis*** extends well away from watercourses and drainage lines	The area occurs entirely on basalt of the Drakensberg Group (Karoo Supergroup). Soils are Mollisols indicating an Udic moisture regime and frigid temperature regime. Frost action is important in alpine soil formation (Mokuku 1991). The freezing and thawing of the soil heaves the soil material, resulting in gradual removal of finer soil particles downslope, mainly from the existing micro-erosion terraces. Soils derived from the basalt have fairly even proportions of coarse sand, fine sand, silt, clay and, importantly, organic matter (around 20%). In many areas the soil is shallow, with surface rock, including some areas with mostly rock rubble, for example on Thabana-Ntlenyana (Killick 1990).	Summer rainfall, but subject to some precipitation from cold fronts in winter. MAP has a considerable range, with 1 609mm at the top of the Organ Pipes Pass on the Escarpment at 2 927m elevation, and only 634mm at a point 365m higher at 3 292m, but between 15 and 20 km away from the Escarpment edge (Killick 1979). There is thus a rapid decline in MAP from near (2 - 3km the edge of the Escarpment (but further in the Oxbow area) to the interior even at higher elevations (Bawden & Carrol 1 968, Chakela 1 999). The mean annual temperature of about 4.0°C is lower than that of any of the other vegetation units. Frost occurs probably more than half the year, including occasionally in summer. Letsengla- Terae, at an altitude of 3 000m, holds the record for the lowest temperature ever recorded in Lesotho (-20.4°C in June 1967). See also climate diagram for Gd 10 Drakensberg Afroalpine Heathland	**Endemic Taxa** Low Shrubs: ***Euryops acraeus, Helichrysum pagophilum, Muraltia flanaganii.*** Herbs: ***Astererucifolius, Cotula radicalis, Helichrysum lineatum, H. praecurrens, Jamesbrittenia jurassica, Manulea platystigrna, Psammotropha obtusa, Zaluzianskya chrysops, Z. turritella.*** Geophytic Herbs: ***Disa basutorum, Hesperantha alborosea H. altimotana, Wurmbea pusilla*** **Biogeographically Important Taxa** (Drakensberg endemics, and Drakensberg endemics extending to Griqualand East) Low Shrubs: ***Erica dominans*** (d) ***Eumorphia*** sericea subsp. sericea (d), ***Helichrysum trilineatum*** (d), ***Clutia nana, Erica frigida, E. thodei Euryops decumbens, E. montanus, Felicia drakensbergensis, Gnidia propinqua, Helichrysum milfordiae, H. witbergense, Inulanthera thodei.*** Succulent Shrub: ***Delosperma nubigenum.*** Herbs: ***Cotula linearilobа,*** Felicia ***uliginosa, Glumicalyx lesuticus*** (Lesotho endemic), ***Helichrysum basalticum, H. bellum, H. palustre, HeIiophil alpina, Lobelia galpinii, Sebaea thodeana.*** Geophytic Herbs: ***Romulea luteoflora*** var. ***sanisensis*** (specific link to Hantam-Roggeveld CE), ***Saniella verna*** (generic link to Hantam- Roggeveld CE). Graminoid: ***Ehrharta***

Vegetation unit	**Altitudinal Range**	**Vegetation and Landscape Features**	**Geology and Soils**	**Climate**	**Endemic taxa / Biogeographically important taxa / Remarks**

Drakensberg Montane Forest (described as Northern Afrotemperate Forest in Mucina & Rutherford (2006)).	Most patches occur at altitudes between **1** 450 and 1 900 m, with outliers as low as 1 100 m and around 2 000 m.	Low (in the Low Escarpment region with canopy reaching up to 20 m), relatively speciespoor forests of afromontane origin and some of them still showing clear afromontane character. Found as small patches in kloofs and on sub-ridge scarps at high altitudes (1 500-1 900 m). Canopy dominated usually by *Podocarpus latifolius*, *Olinia*	Shallow acidic soils over sandstones of the Karoo Supergroup, quartzites and rarely also volcanic rocks of Ventersdorp Supergroup and intrusive diabases of PretoriaIgneous Complex		*Iongigluma*. **Remarks** The *Erica-Helichrysurn-Eumorphia* sedge heath of Jacot Guillarmod (1971), although occasionally found on cold wet slopes below the 2 900m, is 'the climax community over most of the area only above 2 900 metres'. Morris et al. (1993) supported the notion of general altitudinal limit of 2 900 m for this unit, but also suggested that it extends tosomewhat lower altitudes onsouthern slopes. This unit also comprises the*Merxmuellera drakensbergensis Festuca caprina* high-altitude Austro-afro Alpine grassland of Du Preez & Bredenkamp (1991). The often common *Themeda triandra* in the eastern grasslands of southern Africa is rare in this unit. Families rich in geophytes (lridaceae, Hyacinthaceae, Orchidaceae) appear to lose significance with increasing altitude (Herbst & Roberts 1974b), yet orchids are prominent along the Escarpment edge (Killick 1990). The strongdiminishing precipitation gradient from the Escarpment edge inland probably helps explain the apparent contradictions between especially earlier accounts of the flora and vegetation based on studies on the edge of the Escarpment and what is observed further into Lesotho.
			.		***Endemic Taxa*** *Tall Tree: Scolopia oreophila. Small Tree: Maytenus albata. Tall Shrub: Sparrmannia ricinocarpa. Herb: Streptocarpus polyanthus subsp. dracomontanus*. **Remarks** In the northern highveld, these forest patches are either imbedded within Savanna Biome or straddle an

Vegetation unit	Vegetation unit	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
		emarginata, Halleria lucida, Scolopia mundii and rarely also by *Widdringtonia nodiflora*, in drier facies also by *Pittosporum viridiflorum, Celtis africana, Mimusops zeyheri, Nuxia congesta* and *Combretum erythrophyllum*. *Xymalos monospora* sometimes dominate patches of speciespoor mistbelt forests of northern KwaZulu-Natal.			ecotone between sourveld grassland and subtropical savanna of the Central Bushveld. This group of forests is a 'high-altitude' analogue to 'high-latitude' afrotemperate forests of the southern and western Cape.
Basotho Montane Shrubland	Altitude 1 480 – 1 940m.	Steep talus slopes and kloofs of the mesas and other mountain flanks supporting tall, in places very dense shrubland dominated by broad leaved mesophyllous shrubs such as *Rhus erosa, Olea europaea* .subsp. *africana, Euclea crispa* subsp. *crispa, Buddleja salviifolia, Leucosidea sericea, Rhus burchellii, Rhamnus prinoides, Scutia myrtina* and *Gymnopentzia buxifolia.* Mesas are often encircled by striking upper cliffs of Clarens Sandstone.	The upper layers of the mudstones an sandstones of the Molteno, Elliot and Clarens Formations (Stormberg =Group, Karoo Supergroup). The variations in weathering rates of the rocks resulted in the formation of numerous terraces along the slopes. In places the dolerite dykes cut through the thick sandstones, resulting in the formation of sheltered ravines. The soil surface is strewn with sandstone rocks and boulders.	This unit receives more than 720mm of MAP. Wepener and Harrismith score 629 and 624 mm, respectively, while some patches found closer to the Maloti Mountain range (such as on Qwaqwa Mountain near Phuthaditjhaba) may receive more than 1 400 mm in particularly wet years. Most of the rain falls in summer and much of it as convectional rain, with torrential storms. The overall MAT is 13.7°C. Summers are wet and hot, while winters are (as a rule) dry and with frequent frost. Snowfall is a rare event.	**Endemic Taxa** Herbs: *Lessertia tenuifolia, Leucaena latisiligua* **Remarks** This shrubland unit is embedded in wet/moist grass-, lands such as the Eastern Free State Sandy Grassland and Zastron Moist Grassland. Locally, in deep, sheltered kloofs, this shrubland on rare occasions comes into contact with Northern Afrotemperate Forests. The unit includes the historically significant mesa of Thaba Bosiu in Lesotho.
Drakensberg-Amatole Afromontane Fynbos	Most patches found at altitudes around 1 660m, and then from 1 900 - 2 060m, with notable outliers situated as low as 1 520m and as high as 2 600m.	Steep valleys and escarpment slopes at the head of rivers with small stands in stream gullies and depressions. Evergreen shrublands 1 - 3m tall, many shrubs with ericoid leaves. The most prominent shrubland elements comprise genera such as *Passerina, Cliffortia, Erica, Euryops, Helichrysum, Macowania, Protea, Widdringtonia* and *Ischyrolepis*	Jurassic basalts (Drakensberg Group) and a variety of Karoo Supergroup sedimentary rocks (mainly sand-stone of the Clarens Formation of the Stormberg Group) giving rise to soils of varying depth and nutrient status. Dominant land type Ac, followed	Summer-rainfall region, with MAP 800 - 1820mm (overall regional MAP 1167mm). Snowfalls are occasional and summer mists occur frequently. Overall regional MAT of 12.2°C might be misleading since summer days can be quite hot and frost occurs frequently in winter (more than 40 days) and the sheltered position of the afromontane fynbos	**Endemic Taxa** Tall Shrubs: *Melianthus villosus, Polemannia montana.* Low Shrubs: *Cliffortia spathulata* (d), *Helichrysum argyrophyllum* (d), *Erica brownleeae, E. westii, Helichrysum setosum, H. tenax, H. tenuifolium, Macowania conferta, Phylica thodei, Senecio haygarthii.* Herbs: *Berkheya macrocephala, Selago Iongipedicellata*

				habitats	
Vegetation unit	**Altitudinal Range**	**Vegetation and Landscape Features**	**Geology and Soils**	**Climate**	**Endemic taxa / Biogeographically important taxa / Remarks**
			by Fa and Ad	(steep slopes), often out of direct sun, probably has a profound influence on local microclimate. Hot, dry winds are common from July to October. See also climate diagram for Gd 6 Drakensberg Amathole Afromontane Fynbos.	**Biogeographically Important Taxa** (Drakensberg endemics, and Drakensberg endemics extending to Griqualand East) Tall Shrub: *Lotononis lotononoides* (d). Low Shrubs: *Erica ebracteata* (d), *E. algida, E. dissimulans, E. frigida, Euryops tysonii, Helichrysum albirosulatum.* **Remarks** Two structurally similar but floristically very different afromontane fynbos (or fynbos-like) shrublands can be recognised in the Drakensberg and broader surrounds. These two subunits are also differentiated in terms of altitude and the grasslands within which they are embedded.
Eastern Free State Sandy Grassland	1 520 - 1 800m, but reaching 2 020 m in places.	Flat to slightly undulating and undulating terrain with streams and rivers that drain the foothills of the Drakensberg. Closed grassland dominated by *Eragrostis curvula, Tristachya leucothrix* and *Themeda triandra.* Other dominant grasses include *E. capensis, F. racemosa, Cymbopogon pospischiIii, Elionurus muticus, Eragrostis plana* and *Aristida junciformis.* Numerous herb species (especially Asteraceae: species of *Helichrysum, Vernonia, Berkheya)* increase alpha diversity considerably. Embedded within many hills and small mountains carrying Gm 5 Basotho Montane Shrubland. Due to wide range of grazing and fire regimes, the grassland has a patchy appearance.	Mudstones, sandstones and shale of the Beaufort Group (Tarkastad Formation in the south and Adelaide Formation in the north). Glenrosa, Bonheim, Avalon and Mayo soil forms dominate the outcrops and slightly elevated areas while Sepane, Arcadia and Rensburg soil forms are typical for moist bottomlands. Major land types Bb, Bd and Ca.	Summer-rainfall region, with MAP around 700mm. Much of the precipitation falls in form of thunderstorms between November and March. Great differences between the average temperatures in winter and summer as well as very frequent occurrence of frost confirm a continental climate. See also description of climate for Gm 3 Eastern Free State Clay Grassland and climate diagram for Gm 4 Eastern Free State Sandy Grassland.	**Biogeographically Important Taxon** (Low Escarpment endemic) Low Shrub: *Heteromma krookii.* **Remark** The abundance of many species of *Helichrysum* is conspicuous.

Vegetation unit0	Altitudinal Range	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
Lesotho Highland Basalt Grassland	Altitude about 1 900 - 2 900m.	Landscape consists of many plateaus and highridges of mountains separated by often deep valleys. Although many valley slopes are steep, major cliff faces are only occasionally encountered, especially along parts of the main Maloti Mountain chain. Vegetation is closed, short grass- land with many areas also with *Passerina montana-dominated* shrubland. The much smaller shrubs, such as *Chrysocoma ciliata* and *Pentzia cooperi*, are often very common also in clearly disturbed areas (especially on the warmer slopes at higher altitudes). *Chrysocoma ciliata* is the typical component of 'sehalahala scrub' (Anonymous 2000). Within the considerable altitude range in the unit there are many plant species that extend to various altitudinal levels or belts. Also in terms of dominants, for example, *Themeda triandra* tends to be more important at the lower and middle levations and *Festuca caprina* at higher altitudes, although there is considerablealtitudinal overlap between these species. Although *Kniphofia caulescens* has a wide altitudinal distribution, its large aggregate patches (often hundreds of square metres in extent) are mostly evident in the upper half of the altitudinal range corresponding to larger sponge areas (2 500 to 2 900m with most mass flowering displays best observed around 2 700m within Lesotho). The mediumtall distinctive grass *Merxmuellera macowanii* occurs along water courses and drainage lines.	The area is almost entirely underlain by basaltic lava flows of the Drakensberg Group, with some of the shallow soils covering sandstones of the Clarens Formation (Stormberg Group, Karoo Supergroup) in the form of disintegrating carpets. Soils derived from the basalt have fairly even Proportions of coarse sand, fine sand, silt, clay and organic matter. The organic matter increases from about 20% on the slopes to about 26% in the valleys (Herbst & Roberts 1974a). The high organic content (acid, slowly decomposing humus formed largely by decaying grass roots) results in a high waterretention capacity of the soil. Water redistribution through seeps is frequent. Main land type, at least in the South African section, is Ea.	Summer rainfall, with little rain in winter, particularly away from the Northern Escarpment. Much of the area is in a rainshadow with weather stations such as Mokhotlong at an elevation of 2377m with a MAP of only 575mm (Tyson et aI. 1 976, Killick 1 978a). MAP is higher along the eastern edge, for example, 928mm at Qacha's Nek and also in the southeast, with 686mm at Barkly East Golf Club. Mean monthly maximum and minimum temperatures for Barkly East Golf Club are 31.4°C and - 10.5°C for December and July, respectively. Frost occurs throughout winter and on occasion even in summer at higher elevations. Snow occurs in winter, especially at higher elevations where some light snow can occur in summer. There is a high incidence of lightning in summer and hail is common. See also climate diagram for Gd 8 Lesotho Highland Basalt Grassland.	**Endemic Taxa** Herbs: *Argyrolobium summomontanum, Conium fontanum* var. *alticola, Cynoglossum alticola, Glumicalyx apiculatus, Helichrysum nimbicola, Jamesbrittenia beverlyana, Lessertia dykei, Polygala erubescens, Selago melliodora, Strobilopsis wrightii, Zaluzianskya oreophila*. Geophytic Herbs: *Dryopteris dracomontana, Gladiolus saundersii, Hesperantha exiliflora, Kniphofia hirsuta, Moraea alpina, Ornithogalum sephtonii.* Parasitic Herb: *Harveya pulchra*. Low Shrubs: *Clutia alpina, Erica caffrorum* var. *aristula, E. dracomontana, Euryops evansii* subsp. *dendroides, E. inops, Jamesbrittenia lesutica, Macowania pulvinaris.* Succulent Shrubs: *Aloe polyphylla* (Lesotho endemic), *Delosperma aliwalense, D. clavipes.* **Biogeographically Important Taxa** (Drakensberg endemics, and Drakensberg endemic extending to Griqualand East) Graminoids: *Ehrharta longigluma, Helictotrichon galpinii, Pentaschistis airoides* subsp. *jugorum, P. exserta, P. galpinii, Polevansia rigida, Restio galpinii.* Herbs: *Alchemilla colura, Alepidea pilifera, Berkheya cirsiifolia, B. multijuga, Cephalaria galpiniana* subsp. *simplicior, Diascia anastrepta, Felicia linearis, Glumicalyx flanaganii, G. lesuticus* (Lesotho endemic), G.*montanus, Helichrysum album, H. aureum* var. *scopulosum, H. aureum* var. *serotinum, H. basalticum, H. bellum, H. elegantissimum, H. palustre, H. subfalcatum, Heliophila alpina, Lobelia galpinii, Psammotropha mucronata* var.

					marginata, Sebaea thodeana, Senecio tugelensis, Wahlenbergia polytrichifolia subs. *dracomontana , Zaluzianskya rubrostellata.* Geophytic Herbs: *Corycium alticola, Cyrtanthus flanaganii, Disa cephalotes* subsp. *frigida, D. D. thodei, Eucomis schijffii, Euryops decumbens, E. evansii* subsp. *evansii, F. tysonii. Galtonia regalis, Gladiolus microcarpus, Hesperantha schelpeana, Huttonaea grandiflora, Moraea alticola, Rhodohypoxis rubella, Schizochilus angustifolius, Tulbaghia montana.* Semiparasitic Herb: *Thesium decipiens.* Herbaceous Climber: *Cyphia tysonii.* Low Shrubs: *Helichrysum sessilioides* (d), *Berkheya rosulata, Clutia nana, Erica algida, E. dissimulans, E. dominans, E. dracomontana, E. flanaganii, E. schlechteri, E. straussiana, Eumorphia sericea* subsp. *sericea, Felicia drakensbergensis, Gnidia compacta, G. propinqua, Helichrysum marginatum, H. trilineatum, H. witbergense, Inulanthera thodei, Passerina drakensbergensis, Relhania acerosa, R. dieterlenii.* Succulent Shrub: *Delosperma nubigenum.* **Remark** This unit constitutes the major part (in terms of area) of the Drakensberg Alpine Centre of Endemism (Van Wyk & Smith 2001). TheSehlabathebe area has a remarkably high bulbous component such as orchids, which require high soil moisture over prolonged periods of time. The dominant shrub of the slopes of the Western Lesotho Basalt Shrubland *(Leucosidea sericea)* seems, curiously, to be largely absent from even the lower slopes of this unit.

Vegetation unit	Altitudinal Range	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
Low Escarpment Moist Grassland	1 300 - 2 000m.	Complex mountain topography. Steep, generally east- and south-facing slopes, with a large altitudinal range. Supporting tall, closed grassland with *Hyparrhenia hirta* and *Themeda triandra* dominant. *Protea caffra* communities and patches of *Leucosidea* scrub feature at higher altitudes.	Ecca and Beaufort Groups (Karoo Supergroup) mudstone or shale. Soils are mainly of the Hutton form, but also shallower forms such as Glenrosa and Mispah. Half of the area is classified as Fa land type,while the rest is shared among Ac, Bb and Ad land types.	Summer rainfall, with peak from December to January. Frequent fog adds to the overall precipitation. MAP is almost 920mm and mean annual evaporation reaches 1 770mm. MAT of 14.3°C and almost 30 days of frost indicate that the unit is found close to the lower limit of warm-temperate climate. See also climate diagram for Gs 3 Low Escarpment Moist Grassland.	**Endemic Taxon** Geophytic Herb: *Holothrix majubensis.* **Biogeographically Important Taxon** (Low Escarpment endemic) Low Shrub: *Heteromma krookii.* **Remark** A series of patches of Northern KwaZulu-Natal Mistbelt Forests (see Von Maltitz et al. 2003) are embedded within this type of grassland in sub-escarpment regions and deep-kloof positions.
Northern Drakensberg Highland Grassland	1 460 - 2 060m, mostly 1 780 - 1 840m.	Mountainous region characterised by steep slopes of broad valleys and supporting mainly short, sour grasslands, rich in forbs. So-called '*Protea* savannas'—grasslands that contain widely scattered trees of *Protea caffra* nd occasionally *P. roupelliae* - fall within this unit. Sandstone cliffs, a major characteristic of this landscape, create a multitude of special habitats (often fire-protected) for many special plant communities.	Mudstone and sandstone of the Elliot Formation and sandstone of the Clarens Formation (Stormberg Group, Karoo Supergroup) supporting soils typical of the Fc land type (dominant) as well as Ac and Bb land types (of lesser importance).	Summer-rainfall region, with MAP broadly ranging from 720—1 630 mm (overall average MAP 1 017 mm). Snowfalls are occasional and last several days. Summer mists frequent. Hot dry winds frequent from July to October. Summers warm and winters cold, with frequent considerably severe frost events. Overall regional MAT 13.4°C. See also climate diagram for Gd 5 Northern Drakensberg	**Endemic Taxa** Geophytic Herbs: *Gladiolus loteniensis, Hesperantha scopulosa*. **Biogeographically Important Taxa** Herbs: *Alepidea pilifera, Chironia peglerae*. Geophytic Herbs: *Asclepias oreophila, Elaphoglossum drakensbergense, Eucomis schijffii, Galtonia regalis, Merwilla dracomontana, Ornithogalum diphyllum*. Low Shrubs : *Erica ebracteata* (d), *E. aestiva var.*

Vegetation unit	Altitudinal Range	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
				Highland Grassland	*aestiva, E. algida*
uKhahlamba Basalt Grassland	1 820 - 3 300m	Species-rich grasslands of varying levels of density, forming girlands (terraced tussocks) due to steepness of slopes. Comprising a series of communities dominated by ***Bromus speciosus, Pentaschistis tysoniana, Cymbopogon nardus, Festuca caprina, Rendlia altera*** and ***Themeda triandra*** that are accompanied by numerous (and in places dominant) herbs ***(Agapanthus, Merwilla, Helichrysum)*** and shrubs ***(Erica, Helichrysum, Euryops).*** Deep gullies on basalt support luxuriant tall-herb vegetation. Steep basalt rock faces and terraces (the most imposing array of cliffs in southern Africa) are the most dramatic landscape element characteristic of the uKhahlamba (The Barrier of Spears).	Basalts of the Drakensberg Group (Karoo Supergroup) a result of prolonged volcanic activity accompanying the birth of the African continent by breaking from Gondwana. Deep nutrient-rich soils are formed on less steep slopes, while basalt outcrops usually do not carry any fine soil, except for shallow pockets of basalt rubble. Dominant land type Fa, followed by Ac and Ic.	Summer rainfall, with MAP 830 - 1 820mm (overall regional MAP 1 234mm). Great temperature differences between summer some days with temperature exceeding 30°C) and winter, characterised by occurrence of snow (does not persist for long on steep exposed slopes) and frequent frost (55 days per year). Morning summer mists are also frequent, but so are hot, dry winds from July to October. Depending on altitude and aspect, the climate characteristics vary considerably. See also climate diagram for Gd 7 uKhahlamba Basalt Grassland.	**Endemic Taxa** (Northern Berg and Southern Berg only, respectively) Graminoids: ***Merxmueller aureocephala.*** Herbs: ***Aplanodes doidgeana, Berkheya draco, B. leucaugeta, Diascia austromontana, D. purpurea, D. tugelensis, Dracosciadium saniculifolium Geranium drakensbergenis, Gerbera parva, H. armplectens, H. evansii, H. heterolasium, H. mollifolium, Heliophila formosas, Hermannia malvifolia , Indigofera pseudoevansii, Melpomene flabelliformis, Nemesia glabriuscula, Pimpinellakrookii, Satureja compacta, S. grandibracteata, Sebaea radiata, Selago trauseldii, Senecio basalticus, S. brevilorus, S. cristimontanus, S. dissimulans, S. mauricei, S. parentalis, S. polelensis, S. praeteritus, S. qathlambanus, S. saniensis, S. telmateius, S. thamathuensis, Wahlenbergia pulvillus-gigantis, W. tetramera, Xerophyta longicaulis, Xysmalobium woodii.*** Geophytic Herbs: ***Albuca affinis, Brachystelma alpinum, Crocosmia pearsei, Cyrtanthus erubescens, Disa dracomontana, Drimia saniensis, Gladiolus flanaganii, G. symonsii, Glossostelma xysmalobioides, Hesperantha altimontana, H. curvula, H. pubinervia, Moraea vigilans, Rhodohypoxis incompta, R. thodiana, Schizoglossum crassipes, S. elingue*** subsp. ***elingue, S. elingue*** subsp. ***purpureum, S. hilllardiae, Wurmbea burttii, W. tenuis*** subsp. ***australis.*** Parasitic Herb:

	Altitudinal Range	Vegetation and Landscape Features	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
					Harveya leucopharynx. Low Shrubs: *Erica aestiva* var. *minor*, *E. caffrorum* var. *luxurians*, *E. flanaganii*, *Eumorphia prostrata*, *Euryops brevipes*, *E. evansii* subsp. *parvus*, *Gnidia renniana*, *Helichrysum confertum*, *H. drakensbergense*, *H. haygarthii*, *Inulanthera montana*, *Lessertia stipulata*, *Lotononis virgata*, *Macowania deflexa*, *M. hamata*, *M. sororis*, *Otholoblum fumeum*, *Protea nubigena*, *Struthiola angustiloba* . Succulent *S*hrubs: *Delosperma Iavisiae*, *Othonna burttii.* **Biogeographically Important Taxa** (Drakensberg endemics, and Drakensberg endemics extending to Griqualand East) Graminoids: *Bromus speciosus* (d) *Carex monotropa*, *Helictotrichon galpinii*, *Pentaschistis exserta*, *P. galpinii*, *Restio galpinii.* Herbs: *Berkheya multijuga* (d) *Alchermilla colura*, *Aster ananthocladus*, *Berkheya pannosa*, *Cephalaria galpiniana* subsp. *simplicior*, *Chironia peglerae*, *Cotula lineariloba* , *Diascia anastrepta* , *D. vigilis*, *Felicia linearis*, *Glumicalyx flanaganii*, *Helichrysum albirosulatum*, *H. album*, *H. argentissimum*, *H. aureum* var. *scopulosum*, *H. aureum* var. *serotinum*, *H. basalticum*, *H. bellum*, *H. subfalcatum*, *Psammotropha mucronata* var. *marginata*, *Senecio tugelensis* Geophytic Herbs: *Galtonia regalis* (d), *Asclepias oreophila*, *Cyrtanthus flanaganii*, *Dierama tysonii*, *Disa cephalotes* subsp. *frigida*, *D. oreophila* subsp. *erecta*, *D. stricta D. thodei*, *Elaphoglossum drakensbergense*, *Eucomis schijffii Gladiolus microcarpus*, *Hesperantha schelpeana*, *Huttonaea grandiflora*, *H. woodii*, *Miraglossum superbum*, *Moraea alticola*, *Saniella verna*

Vegetation unit	Altitudinal Range	Altitudinal Range	Geology and Soils	Climate	Endemic taxa / Biogeographically important taxa / Remarks
					(generic link to Hantam-Roggeveld C E), *Schizochilus angustifolius, Schizoglossum montanum, Tulbaghia montana.* Herbaceous Climber: *Cyphia tysonii.* Low Shrubs: *Berkheya rosulata, Comborhiza virgata, Erica flanaganii, E. straussiana, E. thodei, E. wyliei, Euryops decumbens, E. evansii* subsp. *evansii, E. montanus, Gnidia compacta, Helichrysum glaciale, H. milfordiae, H. sessilioides, H. witbergense, Passerina drakensbergensis*

Appendix 2 Red Data Plant Species

Table 1: Priority Red Data Plant Species

Species name	Red Data Category
Barleria argillicola	Data Deficient
Barleria greenii	Endangered
Bowiea volubilis	Vulnerable
Calpurnia woodii	Vulnerable
Crocosmia pearsei	Vulnerable
Encephalartos ghellinckii	Vulnerable
Eucomis autumnalis	Vulnerable
Eucomis autumnalis amaryllidifolia	Vulnerable
Eucomis autumnalis clavata	Vulnerable
Eucomis bicolor	Vulnerable
Eucomis humilis	Vulnerable
Eucomis schijffii	Vulnerable
Eulalia villosa	Vulnerable
Geranium ornithopodon	Endangered
Hemizigia bulosii	Data Deficient
Myrsine pillansii	Vulnerable
Ocotea bullata	Vulnerable
Ozoroa paniculosa var. paniculosa	Vulnerable
Protea nubigena	Critically Endangered
Scilla natalensis	Vulnerable
Scolopia flanagani var. oreophila	Vulnerable

Table 2: Additional Red Data Plant Species

Species name	Red Data Category
Aloe aristata	Lower Risk (Near Threatened)
Aloe dominella	Lower Risk (Least Concern)
Aloe kniphofioides	Lower Risk (Least Concern)
Aloe prinslooi	Lower Risk (Near Threatened)
Aristida monticola	Lower Risk (Least Concern)
Aspidonepsis reenensis	Lower Risk (Least Concern)
Barleria argillicola	Data deficient
Barleria greenii	Endangered
Barleria natalensis	Extinct
Berkheya draco	Lower Risk (Least Concern)
Berkheya leucaugeta	Data deficient
Bowiea volubilis	Vulnerable
Brachystelma thunbergii	Lower Risk (Least Concern)
Calpurnia woodii	Vulnerable
Cephalanthus natalensis	Lower Risk (Least Concern)
Comborhiza virgata	Lower Risk (Least Concern)
Cotula lineariloba	Lower Risk (Least Concern)
Cotula radicalis	Lower Risk (Least Concern)
Crocosmia pearsei	Vulnerable
Cryptocarya myrtifolia	Lower Risk (Least Concern)
Curtisia dentata	Lower Risk (Conservation Dependent)
Cyathea dregei	Lower Risk (Least Concern)
Cyphia corylifolia	Data deficient
Cyrtanthus erubescens	Lower Risk (Near Threatened)
Diascia anastrepta	Lower Risk (Least Concern)
Diascia purpurea	Lower Risk (Least Concern)
Diascia tugelensis	Lower Risk (Least Concern)
Diascia vigilis	Lower Risk (Least Concern)
Dierama tysonii	Lower Risk (Least Concern)
Disa basutorum	Lower Risk (Least Concern)
Disa tysonii	Lower Risk (Least Concern)
Disperis concinna	Lower Risk (Least Concern)
Dracosciadium saniculifolium	Lower Risk (Near Threatened)
Encephalartos ghellinckii	Vulnerable

Erica dominans	Lower Risk (Least Concern)
Erica ebracteata	Lower Risk (Least Concern)
Erica flanaganii	Data deficient
Erica straussiana	Lower Risk (Least Concern)
Erica thodei	Lower Risk (Least Concern)
Eucomis autumnalis	Vulnerable
Eucomis autumnalis amaryllidifolia	Vulnerable
Eucomis autumnalis clavata	Vulnerable
Eucomis bicolor	Vulnerable
Eucomis humilis	Vulnerable
Eucomis schijffii	Vulnerable
Eulalia villosa	Vulnerable
Euphorbia clavarioides var. clavarioides	Data deficient
Euphorbia epicyparissias	Data deficient
Euphorbia epicyparissias var. epicyparissias	Data deficient
Euphorbia ericoides	Data deficient
Euphorbia evansii	Data deficient
Euphorbia gueinzii var. gueinzii	Data deficient
Euphorbia natalensis	Data deficient
Euphorbia pseudocactus	Data deficient
Euphorbia sp.	Data deficient
Euphorbia striata var. striata	Data deficient
Euphorbia tirucalli	Data deficient
Faurea macnaughtonii	Lower Risk (Least Concern)
Festuca killickii	Lower Risk (Least Concern)
Ficus burtt-davyi	Lower Risk (Least Concern)
Ficus craterostoma	Lower Risk (Least Concern)
Ficus ingens	Lower Risk (Least Concern)
Ficus sur	Lower Risk (Least Concern)

Ficus thonningii	Lower Risk (Least Concern)
Fimbristylis dichotoma	Lower Risk (Least Concern)
Fimbristylis hispidula	Lower Risk (Least Concern)
Galtonia candicans	Lower Risk (Least Concern)
Galtonia regalis	Lower Risk (Least Concern)
Galtonia viridiflora	Lower Risk (Least Concern)
Garuleum latifolium	Lower Risk (Least Concern)
Garuleum sonchifolium	Lower Risk (Least Concern)
Geranium drakensbergensis	Lower Risk (Least Concern)
Geranium ornithopodon	Endangered
Geranium ornithopodum	Endangered
Gladiolus symonsii	Lower Risk (Near Threatened)
Gladiolus symonsii	Lower Risk (Least Concern)
Glumicalyx goseloides	Lower Risk (Least Concern)
Glumicalyx lesuticus	Lower Risk (Least Concern)
Glumicalyx montanus	Lower Risk (Least Concern)
Gnaphalium confine	Lower Risk (Least Concern)
Gnidia aberrans	Lower Risk (Least Concern)
Gnidia anthylloides	Lower Risk (Least Concern)
Gnidia baurii	Lower Risk (Least Concern)
Gnidia burchellii	Lower Risk (Least Concern)
Gnidia caffra	Lower Risk (Least Concern)
Gnidia capitata	Lower Risk (Least Concern)
Gnidia compacta	Lower Risk (Least Concern)
Gnidia kraussiana var. kraussiana	Lower Risk (Least Concern)
Gnidia polyantha	Lower Risk (Least Concern)
Haemanthus hirsutus	Lower Risk (Least Concern)
Haemanthus humilis hirsutus	Lower Risk (Least Concern)
Haemanthus montanus	Lower Risk (Least Concern)
Helichrysum acutatum	Data deficient
Helichrysum adenocarpum adenocarpum	Data deficient
Helichrysum albirosulatum	Data deficient
Helichrysum albo-brunneum	Data deficient
Helichrysum album	Data deficient
Helichrysum amplectens	Lower Risk (Least Concern)
Helichrysum aureonitens	Data deficient
Helichrysum aureum var. argenteum	Data deficient
Helichrysum aureum var. monocephalum	Data deficient

Helichrysum aureum var. scopulosum	Data deficient
Helichrysum aureum var. serotinum	Data deficient
Helichrysum drakensbergense	Lower Risk (Least Concern)
Helichrysum evansii	Lower Risk (Least Concern)
Helichrysum tenax var. pallidum	Lower Risk (Least Concern)
Helichrysum tenax var. tenax	Lower Risk (Least Concern)
Hemizygia cinerea	Lower Risk (Least Concern)
Hesperantha pubinervia	Data deficient
Hesperantha tysonii	Lower Risk (Least Concern)
Huttonaea woodii	Data deficient
Jatropha natalensis	Data deficient
Kniphofia angustifolia	Lower Risk (Least Concern)
Kniphofia brachystachya	Lower Risk (Least Concern)
Kniphofia breviflora	Lower Risk (Least Concern)
Kniphofia evansii	Lower Risk (Near Threatened)
Kniphofia ichopensis var. aciformis	Lower Risk (Least Concern)
Kniphofia northiae	Lower Risk (Least Concern)
Macowania conferta	Data deficient
Macowania corymbosa	Lower Risk (Least Concern)
Macowania deflexa	Lower Risk (Least Concern)
Manulea florifera	Lower Risk (Least Concern)
Merxmuellera aureocephala	Lower Risk (Least Concern)
Merxmuellera guillarmodiae	Lower Risk (Least Concern)
Miraglossum superbum	Lower Risk (Least Concern)
Moraea pubiflora	Data deficient
Moraea unibracteata	Lower Risk (Near Threatened)
Muraltia alticola	Data deficient
Myrsine pillansii	Vulnerable
Nerine bowdenii	Lower Risk (Least Concern)
Ocotea bullata	Vulnerable
Olinia radiata	Lower Risk (Least Concern)
Ornithogalum sephtonii	Lower Risk (Least Concern)
Ornithogalum sp.	Lower Risk (Least Concern)
Otholobium fumeum	Lower Risk (Least Concern)
Othonna burttii	Lower Risk (Least Concern)
Ozoroa paniculosa var. paniculosa	Vulnerable
Pachycarpus campanulatus var. campanulatus	Lower Risk (Least Concern)
Pachycarpus dealbatus	Data deficient

Pachycarpus natalensis	Lower Risk (Least Concern)
Passerina drakensbergensis	Lower Risk (Least Concern)
Peucedanum thodei	Lower Risk (Least Concern)
Polygala praticola	Data deficient
Protea dracomontana	Lower Risk (Least Concern)
Protea nubigena	Critically endangered
Protea subvestita	Lower Risk (Near Threatened)
Prunus africana	Lower Risk (Conservation Dependent)
Sandersonia aurantiaca	Lower Risk (Conservation Dependent)
Satureja grandibracteata	Lower Risk (Least Concern)
Satyrium microrrhynchum	Lower Risk (Least Concern)
Schizochilus bulbinella	Lower Risk (Least Concern)
Schizoglossum atropurpureum	Lower Risk (Near Threatened)
Schizoglossum atropurpureum atropurpureum	Lower Risk (Near Threatened)
Schizoglossum bidens atrorubens	Data deficient
Schizoglossum elingue elingue	Lower Risk (Least Concern)
Schizoglossum hilliardiae	Lower Risk (Least Concern)
Schizoglossum stenoglossum flavum	Lower Risk (Least Concern)
Schizoglossum stenoglossum stenoglossum	Lower Risk (Least Concern)
Scilla natalensis	Vulnerable
Scolopia flanagani var. oreophila	Vulnerable
Selago monticola	Lower Risk (Least Concern)
Senecio basalticus	Lower Risk (Least Concern)
Senecio brevilorus	Lower Risk (Least Concern)
Senecio dregeanus	Lower Risk (Near Threatened)
Senecio erubescens var. crepidifolius	Data deficient
Senecio erubescens var. erubescens	Data deficient
Senecio glanduloso-pilosus	Lower Risk (Least Concern)
Senecio hirsutilobus	Lower Risk (Least Concern)
Senecio polelensis	Lower Risk (Least Concern)
Senecio praeteritus	Lower Risk (Least Concern)
Senecio saniensis	Lower Risk (Least Concern)
Stenoglottis longifolia	Lower Risk (Least Concern)
Thamnocalamus tessellatus	Lower Risk (Least Concern)
Thesium virens	Data deficient
Thuranthos basuticum	Lower Risk (Near Threatened)
Tulbaghia montana	Data deficient
Vitellariopsis dispar	Lower Risk (Least Concern

Widdringtonia nodiflora	Lower Risk (Conservation Dependent)
Xerophyta longicaulis	Data deficient
Zaluzianskya chrysops	Lower Risk (Least Concern)

Appendix 3 Priority Animal Species`

Taxonomic name	**Common Name**	**Family**	**Conservation Status**
Anguilla mossambica	Longfin Eel	Freshwater eels	Data deficient
Arthroleptella hewitti	Drakensberg Chirping Frog	Amphibian	Endemic
Afrixalus spinifrons	Natal Leaf Folding Frog	Amphibian	Vulnerable
Breviceps maculates	Spotted Rain Frog	Amphibian	Indeterminate
Bufo gariepensis nubicolus	Drakensberg Toad	Amphibian	Vulnerable
Cacosternum striatum	Striped Dainty Frog	Amphibian	Indeterminate
Heleophryne natalensis	Eastern Ghost Frog	Amphibian	Endemic
Leptopelis xenodactylus	Long-toed Tree Frog	Amphibian	Endangered
Pyxicephalus adspersus	Giant Bullfrog	Amphibian	Near Threatened
Strongylopus hymenopus	Drakensberg Stream Frog	Amphibian	Endemic
Strongylopus wageri	Wager's Stream Frog	Amphibian	Near Threatened
Vandijkophrynus spp	Karoo/Mountain Toad	Amphibian	Endemic
Crex crex	Corn Crake	Bird	Vulnerable

Botaurus stellaris	Eurasian Bittern	Bird	Critically Endangered
Microparra capensis	Lesser Jacana	Bird	Near Threatened
Rostratula benghalensis	Greater Painted-snipe	Bird	Near Threatened
Sagittarius serpentarius	Secretarybird	Bird	Near Threatened
Eupodotis senegalensis	Whitebellied Korhaan	Bird	Vulnerable
Eupodotis caerulescens	Blue Korhaan	Bird	Near Threatened
Anthropoides paradisea	Blue Crane	Bird	Vulnerable
Balearica regulorum	Grey Crowned Crane	Bird	Vulnerable
Grus carunculatus	Wattled Crane	Bird	Critically Endangered
Polemaetus bellicosus	Martial Eagle	Bird	Vulnerable
Circus ranivorus	African Marsh-Harrier	Bird	Vulnerable
Neotis denhami	Denham's Bustard	Bird	Near Threatened
Neotis denhami	Stanley's Bustard	Bird	Near Threatened
Tyto capensis	African Grass-Owl	Bird	Vulnerable
Bucorvus cafer	Southern Ground-Hornbill	Bird	Vulnerable
Geronticus calvus	Southern Bald Ibis	Bird	Vulnerable
Schoenicola platyura platyurus	Broad-tailed Warbler	Bird	Near Threatened
Anthus chloris	Yellow-breasted Pipit	Bird	Vulnerable
Gyps coprotheres	Cape Vulture	Bird	Vulnerable
Gypaetus barbatus	Bearded Vulture	Bird	Endangered
Amphilius natalensis	Natal Mountain Catfish	Fish	Data deficient
Clarias gariepinus	Sharptooth Catfish	Fish	Data deficient
Cyprinus carpio	Carp	Fish	Vulnerable
Proteles cristatus	Aardwolf	Mammal	Rare
Laephotis wintoni	De Winton’s Long-eared Bat	Mammal	Endemic
Pelea capreolus	Grey Rhebuck	Mammal	Scheduled as "Protected game" in KwaZulu-Natal
Panthera pardus	Leopard	Mammal	Rare, Specially protected game in KwaZulu-Natal
Chrysospalax villosus	Rough-haired Golden Mole	Mammal	Critically Endangered
Leptailurus serval	Serval	Mammal	Near Threatened
Lutra maculicollis	Spotted-necked Otter	Mammal	Near Threatened
Nycteris thebaica capensis	Egyptian Slit-faced Bat	Mammal	Near Threatened
Ourebia ourebi	Oribi	Mammal	Endangered
Redunca fulvorufula fulvorufula	Mountain Reedbuck	Mammal	Lower Risk Scheduled as "Protected game" in

			KwaZulu-Natal
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	Mammal	Near Threatened
	Southern African Python	Reptile	Vulnerable
Afroedura nivaria	Montane Flat Gecko	Reptile	*Endemic*
Bradypodion dracomontanum	Drakensberg Dwarf Chameleon	Reptile	Endemic, Restricted
Lamprophis fuscus	Yellow-bellied House Snake	Reptile	Rare
Pelomedusa subrufa	Marsh Terrapin	Reptile	Data deficient
Pseudocordylus langi	Lang's Crag Lizard	Reptile	Restricted
Pseudocordylus spinosus	Spiny Crag Lizard	Reptile	Restricted
Montaspis gilvomaculata	Cream-spotted Mountain Snake	Reptile	Rare
Crocidura maquassiensis	Makwassie Musk Shrew	Rodent	Vulnerable
Dasymys incomtus	Water Rat	Rodent	Near Threatened
Georychus capensis	Cape Mole Rat	Rodent	Endangered
Mystromys albicaudatus	White-tailed Rat	Rodent	Endangered

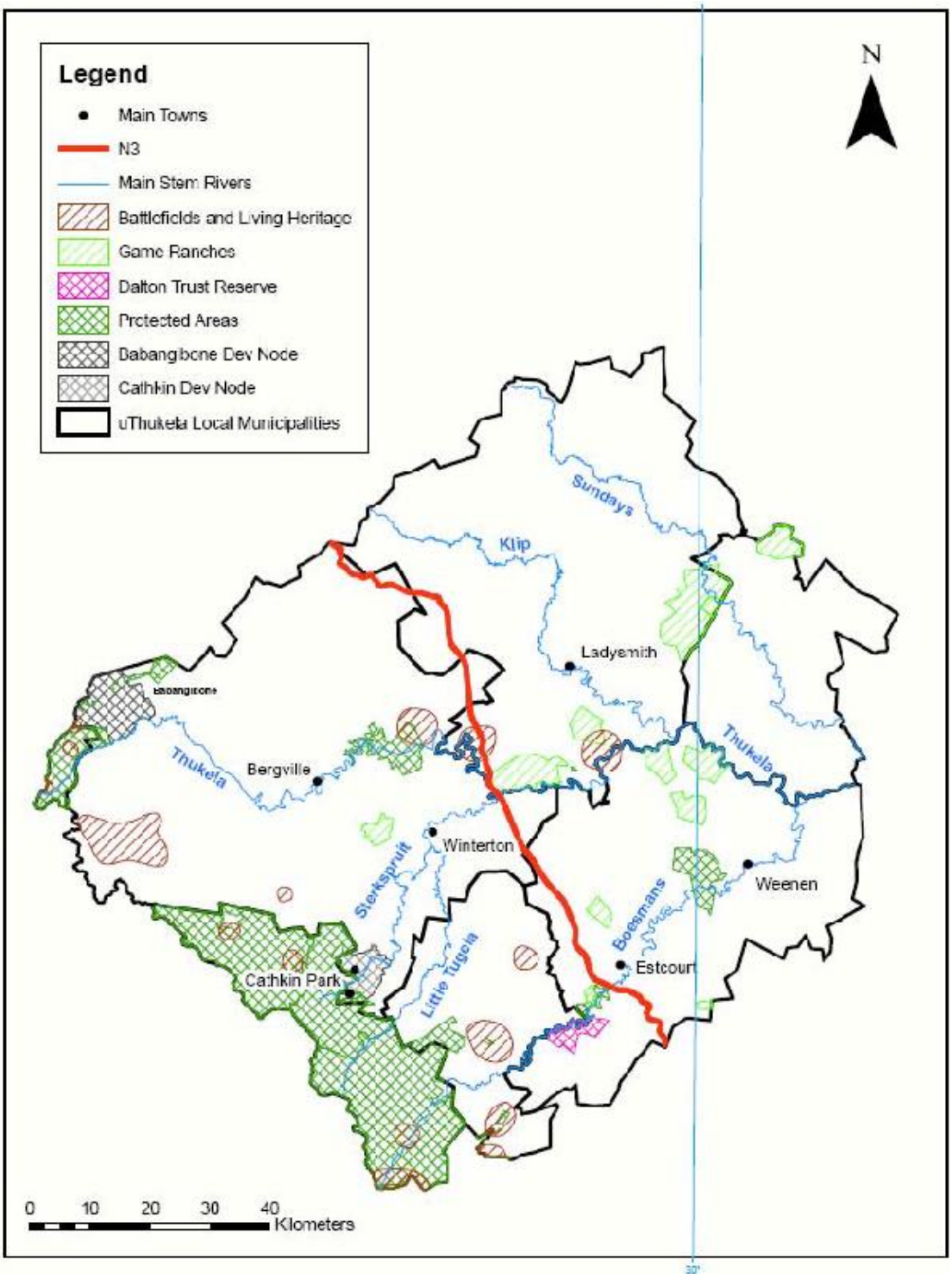
Appendix 4 Vegetation Statistics Relevant to the uThukela District Municipality

Vegetation Type (EKZNW vegetation Conservation target)	National Conservation Status/ KwaZulu-Natal Conservation Status	KwaZulu-Natal vegetation type land cover (ha)	uThukela District Municipality vegetation type land cover (ha)	% of land area in the uThukela District Municipality	% of KwaZulu-Natal vegetation type coverage found within uThukela District Municipality	Area required to meet vegetation conservation target for uThukela District Municipality (ha)	Remaining areas for meeting conservation targets in the uThukela District Municipality (ha)	CBA of vegetation types (ha)[16]	Excess/ deficit on vegetation targets (ha) [17]
Glencoe Moist Grassland (0.24)	Endangered / Endangered	303 087.21	596 279.95	8.52	31.7	23 045.13	69 883.38	28 454.27	608.08
Income Sandy Grassland (0.24)	Vulnerable / Endangered	466 989.85	37 900.93	3.36	8.1	9 096.22	28 352.25	9658.53	-1 332.73
Mooi River Highland Grassland (0.23)	Vulnerable	100 481.88	6 879.77	0.61	6.8	1 582.35	6 330.44	3 251.96	1 325.63
Thukela Valley Bushveld (0.25)	Least threatened	270699.69	90 580.01	8.04	33.5	22 645.00	78 250.19	3 251.96	1 915.94
Drakensberg Foothill Moist Grassland (0.23)	Least threatened / Vulnerable	596 279.95	88 742.47	7.87	14.9	20 410.77	69 648.46	26 801.55	1 953.66
KwaZulu-Natal	Least threatene	501 013.94	194 113.01	17.22	38.7	44 645.99	149 516.95	56 325.5	1 973.86

Highland Thornveld (0.23)	d / Vulnerable							0	
Northern KwaZulu-Natal Mistbelt Forest (0.72)	Least threatened / Vulnerable	14 352.32	2 020.38	0.18	14.1	1 454.68	1 990.36	1 869.62	313.93
Northern KwaZulu-Natal Moist Grassland (0.24)	Vulnerable / Vulnerable	419 947.09	260 445.45	23.11	62.0	62 506.91	187 644.45	75 669.58	140.40
Thukela Thornveld (0.25)	Least threatened/ Vulnerable	231 226.27	146 484.55	13.00	63.4	36 621.14	130 488.17	45 897.74	1 952.38
Drakensberg Afroalpine Heathland (0.27)	Least Threatened / Least Threatened	6 412.71	4 178.55	0.37	65.2	1 128.21	4 168.51	3 234.02	1 896.89
Drakensberg Montane Forest (0.64)	Least Threatened / Least Threatened	4 283.64	3 590.52	0.32	83.8	2 297.93	3 528.31	2 975.06	497.60
Drakensberg Montane Shrubland (0.28)	Least Threatened / Least Threatened	2 776.64	2 745.20	0.24	98.9	768.66	2 696.55	1 222.45	316.54

Drakensberg-Amatole Afromontane Fynbos (0.27)	Least Threatened / Least Threatened	1 708.90	1 133.99	0.10	66.4	306.18	1 133.72	796.91	434.03
Eastern Free State Sandy Grassland (0.24)	Endangered / Least Threatened	4 118.74	3 794.93	0.34	92.1	910.78	3 654.67	2 539.49	1 438.97
Lesotho Highland Basalt Grassland (0.27)	Least Threatened / Least Threatened	1 207.35	436.70	0.04	36.2	117.91	436.70	149.98	10.24
Low Escarpment Moist Grassland (0.23)	Least Threatened / Least Threatened	141 147.55	64 792.47	5.75	45.9	14 902.27	62 634.99	19 690.64	1 548.75
Northern Drakensberg Highland Grassland (0.27)	Least Threatened	71 528.93	62 470.09	5.54	87.3	16 866.93	61 871.45	31 421.36	11 430.93
uKhahlamba Basalt Grassland (0.27)	Least Threatened	120 674.31	60 771.41	5.39	50.4	16 408.28	60 673.96	47 206.26	27 759.42

Appendix 5 Contextual Map of the District



Appendix 6 Remaining Intact Natural Areas in the District, not required for meeting conservation targets