KWADUKUZA BIODIVERSITY AND OPEN SPACE MANAGEMENT PLAN (BOSMaP)

EXECUTIVE SUMMARY

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INR Report No: 464/13

This work is dedicated to the memory of

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And

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Ezemvelo KZN Wildlife

2013

Acknowledgements

The following specialists are acknowledged and gratefully thanked for their assistance in the development of this plan.

1) Ezemvelo KZN Wildlife staff
    a) Dr Boyd Escott
    b) Dr Adrian Armstrong
    c) Mr Rob Scott-Shaw
    d) Mr Rob Karssing
    e) Mrs Debbie Jewitt
2) Dr David Herbert of the Natal Museum
3) Dr Michelle Hamer of the South African National Biodiversity Institute
4) Dr Martin Villet of Rhodes University
5) Mr Steve Woodhall - Author, Field Guide to Butterflies of South Africa, Random House Struik Publishers, Cape Town
6) Dr Doug Harebottle SABAP 2 Project manager at the Animal Demography Unit - University of Cape Town.
7) Dr Jeanne Tarrant of the Endangered Wildlife Trust.
8) Mr Johan Marais of Reptile Ventures – Author. A complete guide to the snakes of southern Africa, Struik Publishers, Cape Town

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1 ASSESSING KWADUKUZA MUNICIPALITY'S NATURAL CAPITAL

1.1 INTRODUCTION

Vast areas of the Kwadukuza municipality have been transformed from their natural state, largely through the cultivation of sugar cane. Of the total municipal area of 73 497.2 Ha, only 17 949.6 is untransformed (24.4%). The degree to which the municipality and surrounding areas have been transformed has meant that remaining untransformed areas have gained a high level of importance from a biodiversity conservation perspective and because of the importance of the ecosystem services which are delivered by these areas.

1.2 FEATURE IDENTIFICATION

All features (species, vegetation types and services) included in the BOSMaP are represented by untransformed patches that have been mapped at a fine scale. These patches represent either suitable available habitat of an important species, a threatened vegetation type in itself or an area offering important ecosystem services.

All patches are classified functionally, structurally, botanically and according to their condition. These classifications have been used to determine a patch's importance in terms of biodiversity conservation and ecosystem service delivery.

1.3 BIODIVERSITY CONSERVATION PLANNING FOR KWADUKUZA

A systematic conservation planning approach has been used to identify important areas in the municipality for the conservation of biodiversity. 'Area for conservation' targets (in hectares) have been assigned to each feature (species/vegetation type) based on their conservation status, the proportional occurrence of the feature in the study area relative to its overall range and on established national and provincial targets for the feature. The relative importance of each untransformed habitat patch is determined based on this.

1.4 ECOSYSTEM SERVICES IN KWADUKUZA

Ecosystem services are those services provided by the environment that benefit people physically and spiritually / emotionally. Important natural vegetation remnants within the KwaDukuza Local Municipality with respect to ecosystem services have been identified. The services supplied by these categories have been assessed and estimated through an expert driven workshop. These scores have been used to classify the importance of each untransformed patch in terms of the services they are likely to supply. The demand for these services was determined using a range of metrics which are detailed in the full report.

2 BIODIVERSITY IN KWADUKUZA MUNICIPALITY

2.1 FAUNA AND FLORA IDENTIFICATION AND MAPPING

A list of species of concern for this study was compiled by consulting existing biodiversity databases, relevant experts and knowledgeable individuals who are familiar with the study area and with the species concerned. Distribution maps have been developed for each feature based on choice of habitat, environmental factors (primarily on level two vegetation categories) and by considering habitat condition ratings.

As a critical part of the biodiversity of this municipality, vegetation types are included in the conservation planning process at the same level as species of importance.

2.2 PRIORITY BIODIVERSITY CONSERVATION AREA IDENTIFICATION

The biodiversity priority areas for the municipality were assessed through the use of C-Plan conservation planning software. Individual species' and vegetation type distributions were merged and analysed to calculate patch irreplaceability with respect to targets determined for each species or vegetation type (figure 2).

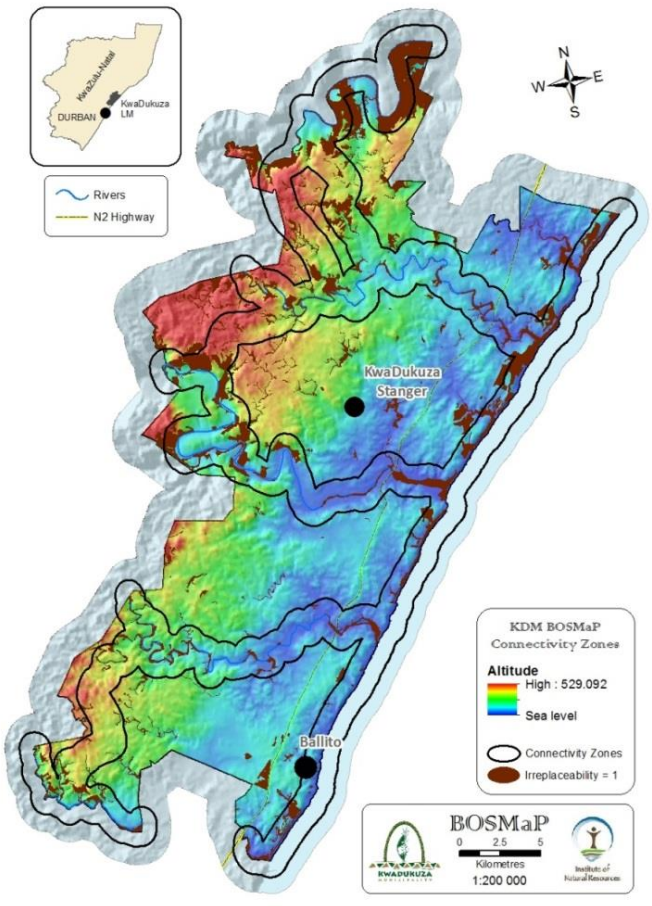


Figure 1 - Biodiversity connectivity zones identified in KwaDukuza Municipality

The summed irreplaceability of all patches was calculated to direct biodiversity management action (figure 3). This metric allows you to isolate areas where action will get the 'most bang for your buck'.

In addition, several important connectivity zones were identified during the course of this study. These are 1) major river courses, 2) Inter-catchment links and 3) the coastal strip. These are illustrated in Figure 1. Connectivity provides physical opportunities for short term individual movements which allow fragmented populations to interact and for the establishment of new populations in areas of suitable habitat that become available. Isolated populations are likely to fall victim to stochastic destructive events and are more likely to become extinct.

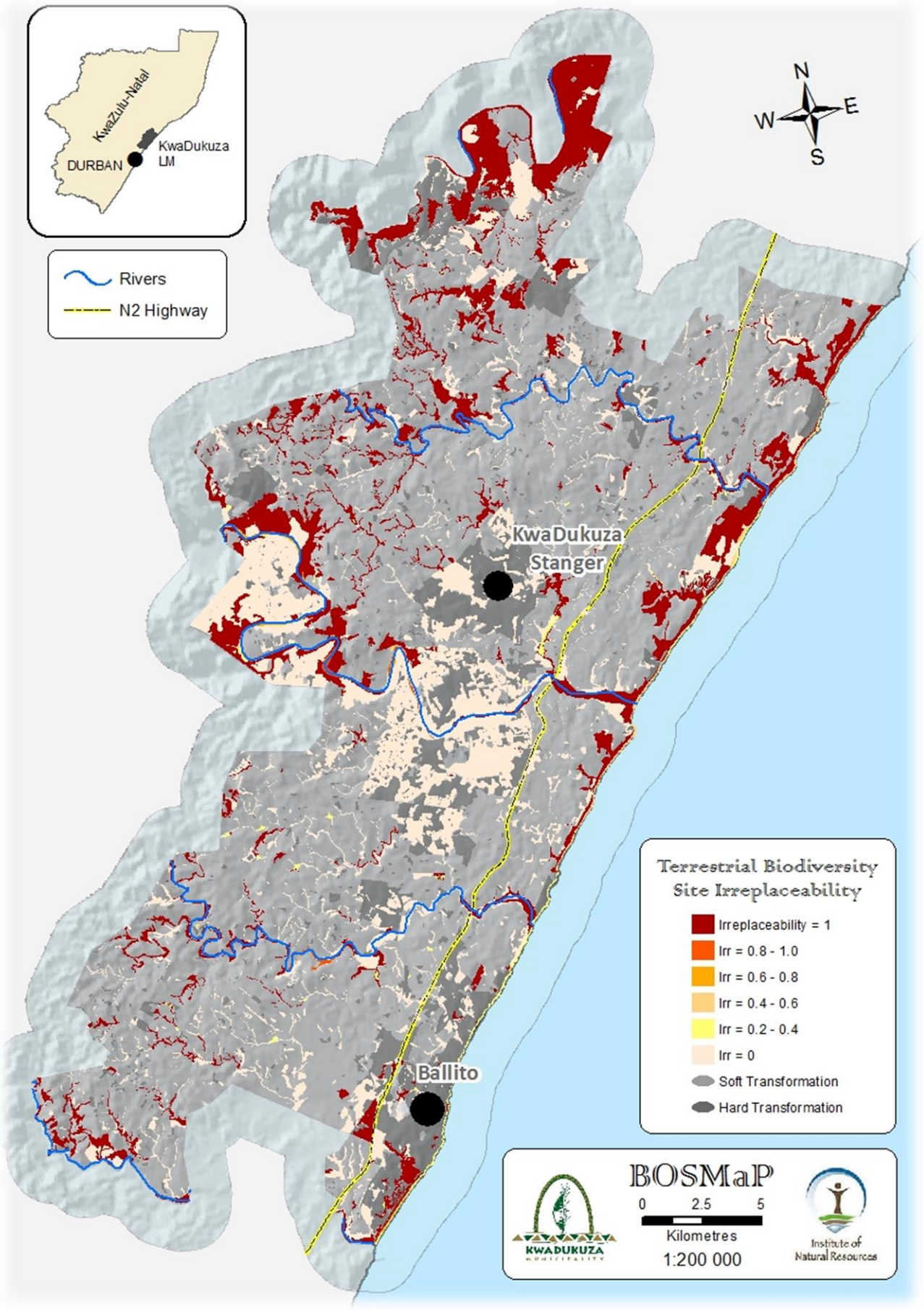


Figure 2 - Terrestrial biodiversity habitat irreplaceability scores

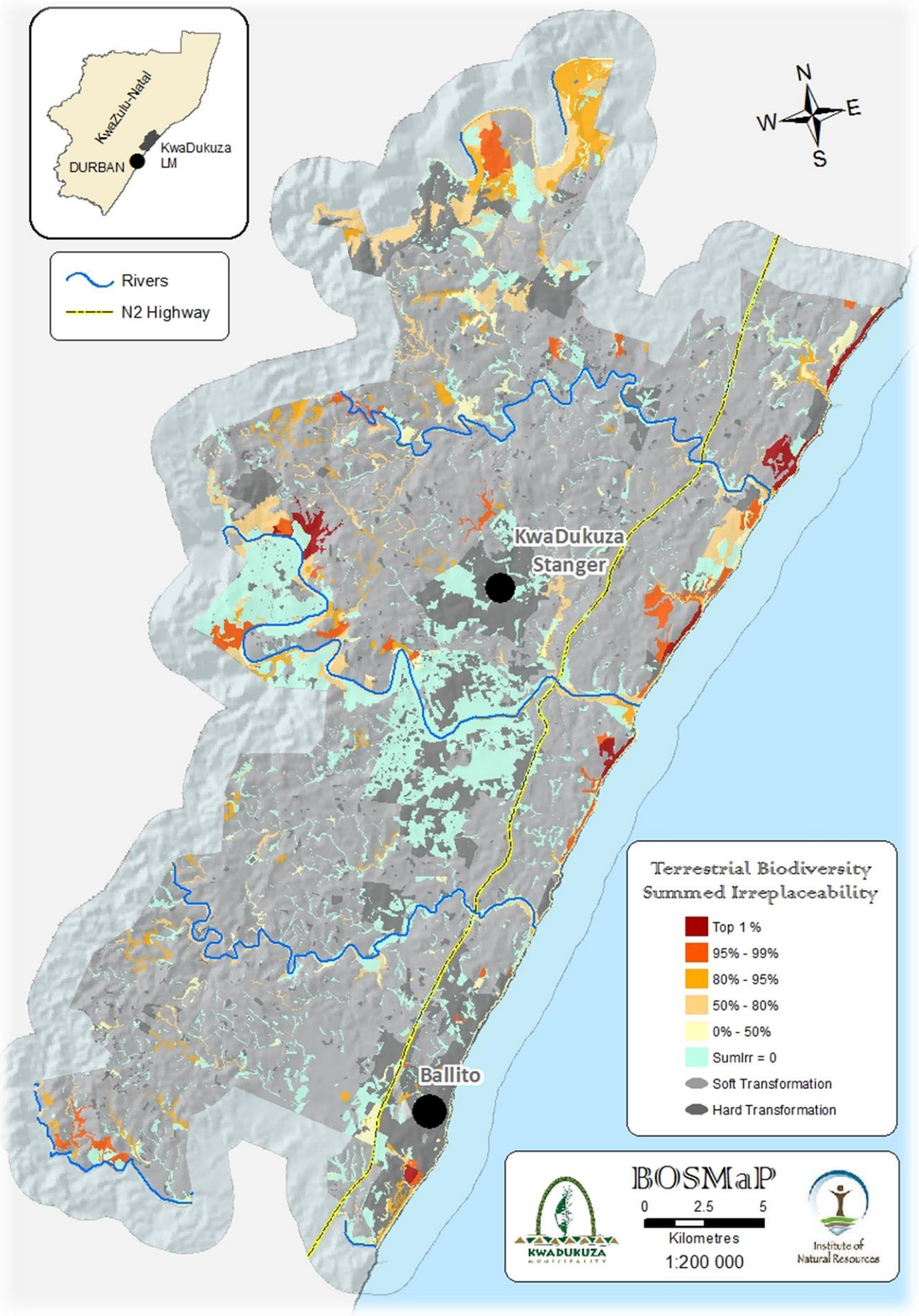


Figure 3 - Terrestrial biodiversity habitat summed irreplaceability scores

3 ECOSYSTEM SERVICES IN KWADUKUZA MUNICIPALITY

3.1 ECOSYSTEM SERVICE IDENTIFICATION AND MAPPING

Services to be included in the study were selected from the TEEB categories and the list refined based on applicability and data availability for the study area. The services included in this study are listed in Table 1 below:

Table 1 - Ecosystem Services categories included in the assessment

Service	Comment
Harvestable natural resources	This includes resources such as reeds, traditional muthi plants etc.
Freshwater	The freshwater service was further subdivided into freshwater supply and water regulation in order to distinguish between the provisioning and regulating components of this service.
Moderation of extreme events	This service was further sub-divided into flood attenuation, flood mitigation and coastal protection.
Waste treatment	Natural features such as rivers and wetlands provide important waste treatment services, purifying water that has been polluted.
Habitat	This category has been considered separately under the biodiversity assessment.
Recreation and mental & physical health	These two categories have been included under a single category of recreation and tourism.
Tourism	
Soil retention	Soil retention was assessed as soil erosion is considered to be an important driver of land degradation across the province as a whole.

Services were mapped using untransformed patches as a surrogate for service provision areas and the level of provision was determined through expert opinion gathered in a workshop environment. Provision level scores were then applied to the mapped patches to provide a representation of service delivery across the municipality.

3.2 PRIORITY ECOSYSTEM SERVICE AREA IDENTIFICATION

3.2.1 Identifying priority ecosystem service areas

Supply and demand layers for each service were combined using the matrix below (Table 2) to identify priority areas for the respective services. These priority levels were assigned to each untransformed habitat patch for each service.

Table 2 - Matrix used for the identification of priority ecosystem service delivery areas

	Demand						
Supply	Very high	High	Moderate to High	Low to Moderate	Low	Very low	No demand
Very high	Priority 1	Priority 1	Priority 1	Priority 1	Priority 2	Priority 3	
High	Priority 1	Priority 1	Priority 1	Priority 2	Priority 2	Priority 3	
Moderate to High	Priority 1	Priority 1	Priority 2	Priority 2	Priority 2	Priority 3	
Low to Moderate	Priority 1	Priority 2	Priority 2	Priority 2	Priority 3	Priority 3	
Low	Priority 2	Priority 2	Priority 2	Priority 3	Priority 3	Priority 3	
Very low	Priority 3	Priority 3	Priority 3	Priority 3	Priority 3	Priority 3	
No supply							

3.2.2 Ecosystem service spatial analysis

The level of ecosystem service delivery can be integrated to show areas where particular services are determined to be at the highest level and, using a separate analysis, where the various services at their highest level intersect (cumulative high priority). These analyses produce two different integrated maps, which can be used differently depending on management objectives.

1. Ecosystem Services – highest priority level: This product indicates areas where high levels of delivery of any of the ecosystem services occur i.e. where supply and demand for particular services coincide (see Figure 4).

2. The 'Ecosystem services – High Priority Count' product indicates where concentrations of high levels of services can be found. In essence this product is equivalent to the biodiversity 'summed irreplaceability product, focusing effort for 'most bang for your buck' (see Figure 5).

The integrated ecosystem services product will not however always provide the information the user is looking for, and the input layers which provide the input data for each service can be consulted for additional information.

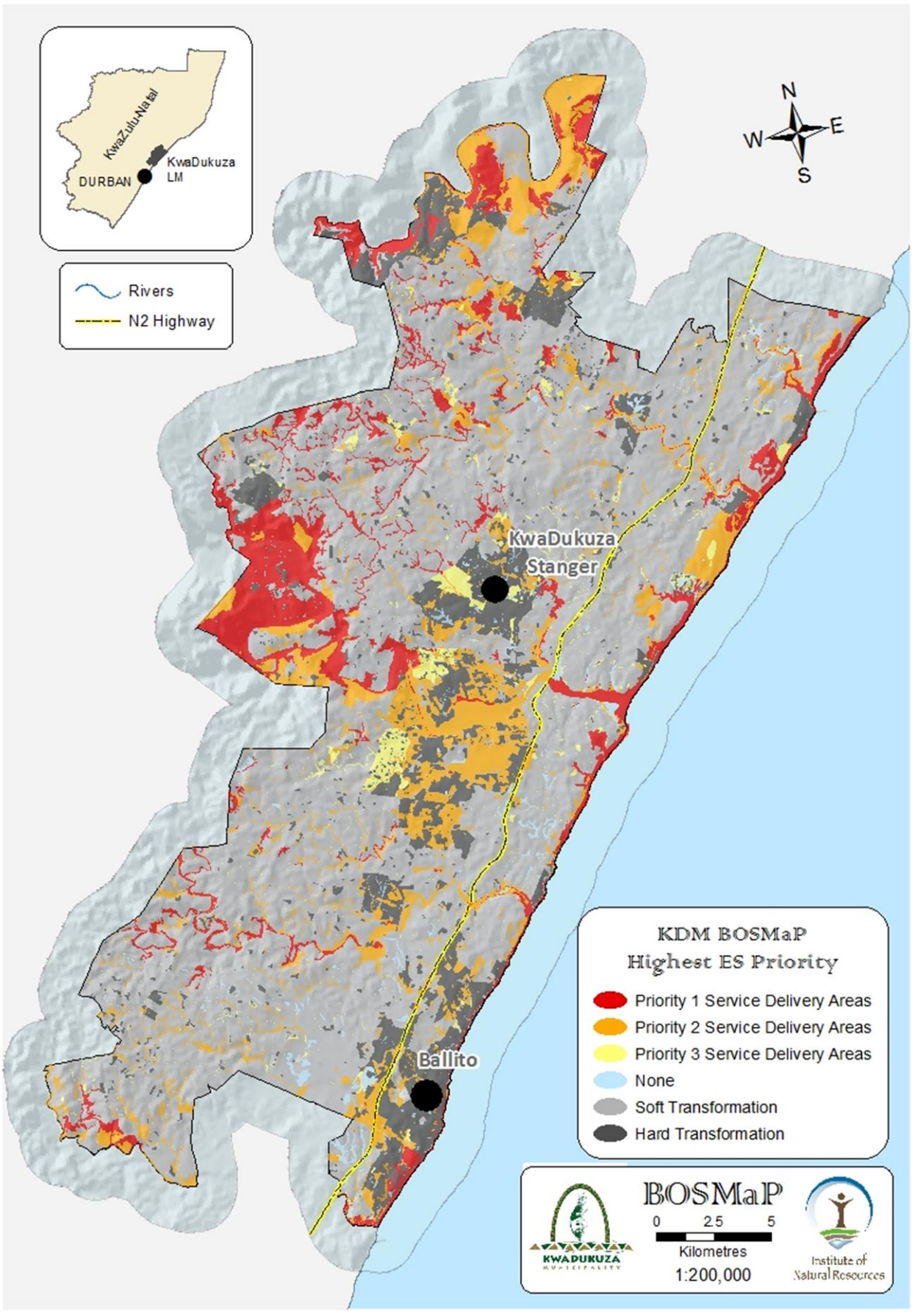


Figure 4 - Ecosystem service priority scores - highest score (for any service) achieved in an area.

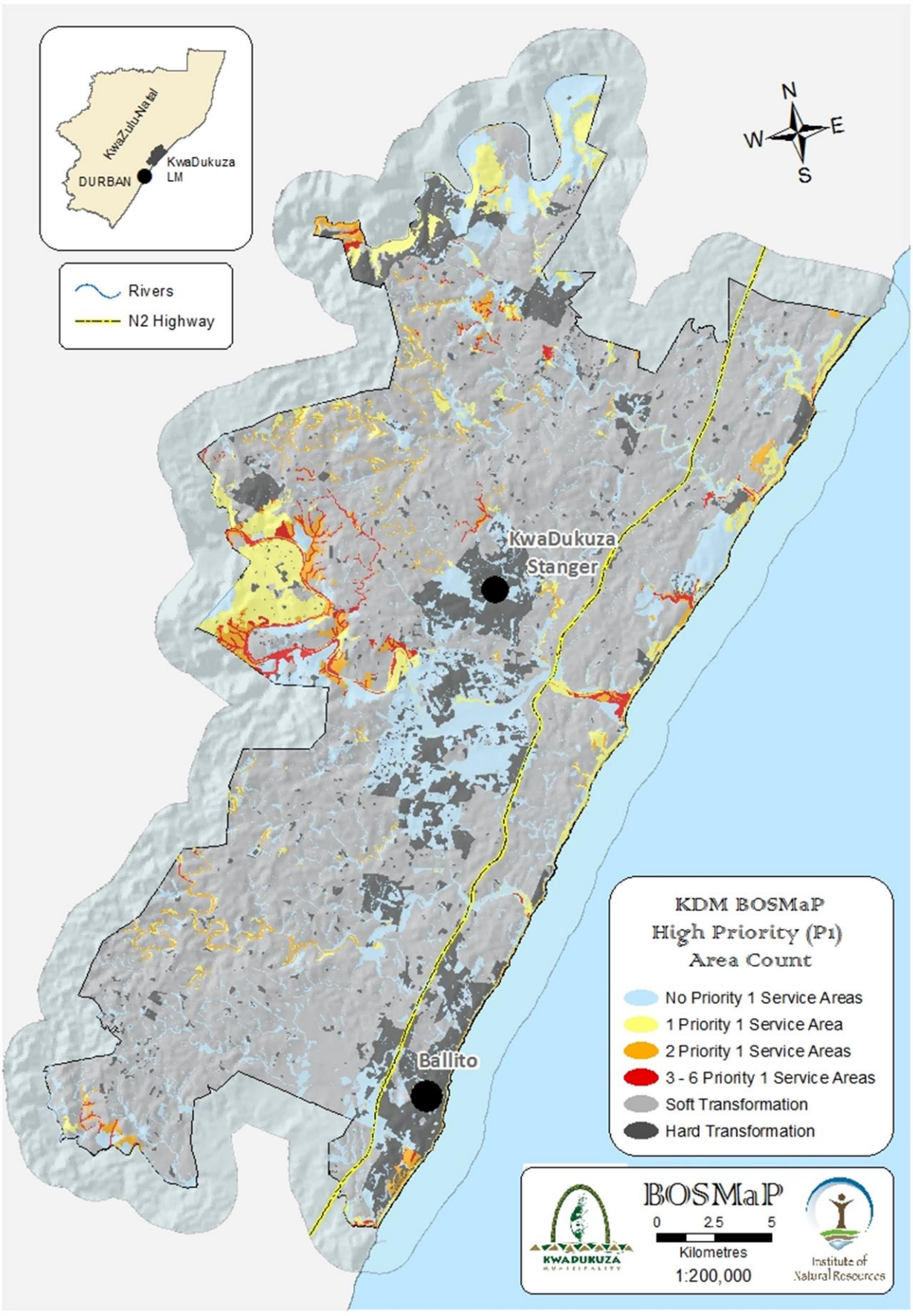


Figure 5 - Ecosystem service priority areas - count of highest priority scores achieved by an area.

4 INTEGRATED BOSMAP RESULTS

The primary objective of this plan is to highlight and provide information about open space areas within KwaDukuza municipality that are important from a biodiversity and ecosystem service perspective. This will enable the municipality to manage these areas sensitively and will allow the important areas to be incorporated into the planning framework of the municipality.

Biodiversity and Ecosystem services can be considered as stand-alone products in their own right, however to obtain the most efficient outcome, it is useful to consider these two products in combination. To achieve this, the two products have been integrated to allow their separate values to be combined (See figure 8 below).

It must be noted that this combined product will not always provide the user with the 'silver bullet' they may be looking for, and the input components (species distributions, irreplaceability scores and the individual ecosystem service layers) should be consulted where necessary to obtain the required information.

The integration of biodiversity and ecosystem services priority scores was carried out based on the matrix illustrated in Table 3 below.

Table 3 - Integration matrix used to establish a priority score for for BOSMaP areas

		Ecosystem Service Priority Score			
		1	2	3	0
Biodiversity Priority Score	1	1	1	1	2
	2	1	2	2	2
	3	1	2	3	3
	0	2	2	3	0

The integrated product provides a wealth of information about any of the untransformed land mapped during this project. This information is held in the attribute table of the BOSMaP shapefile. Table 23 below provides an explanation of the information in each of the fields of this attribute table, and includes an example of one site (or polygon) from the database.

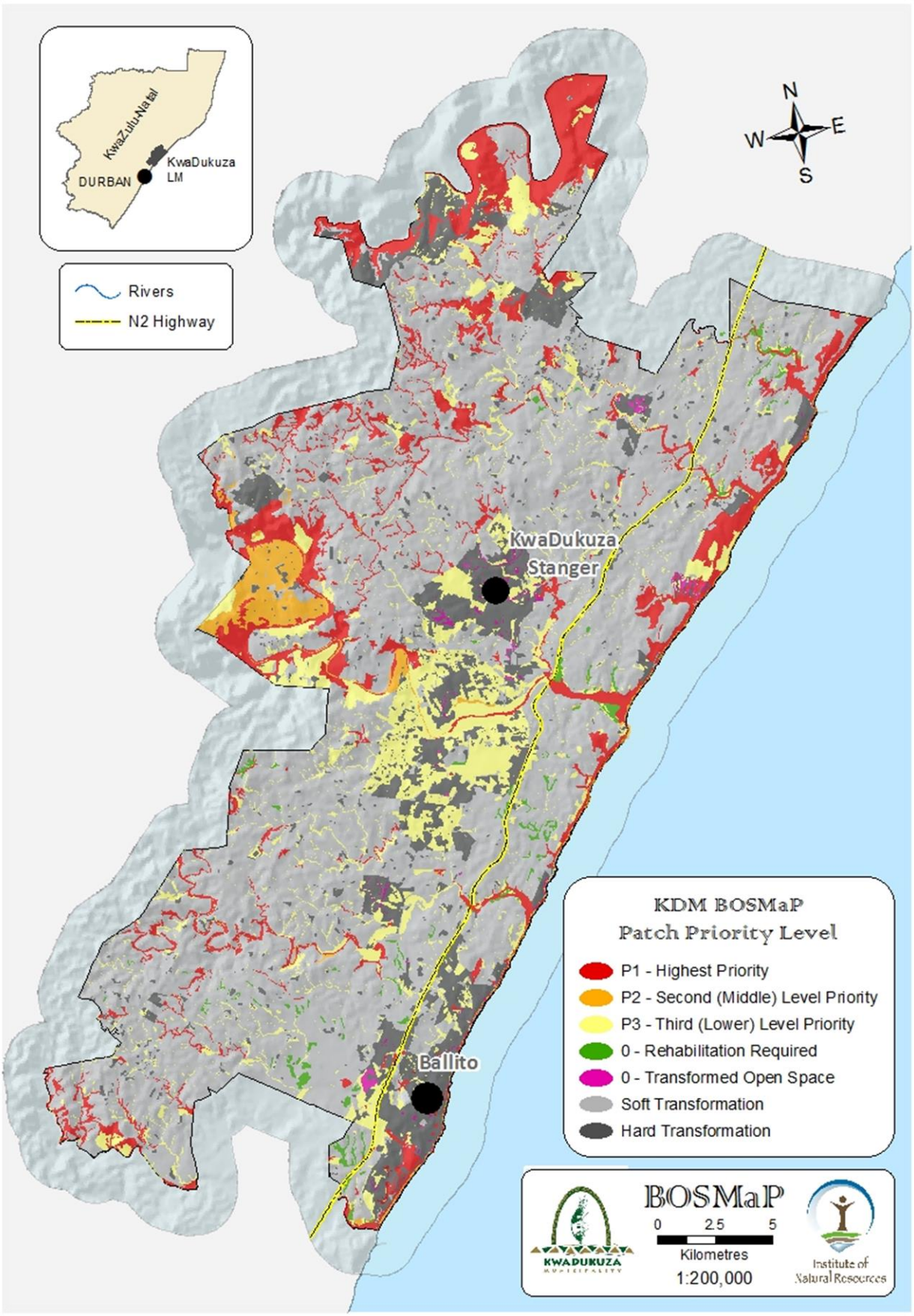


Figure 6 – Integrated BOSMaP product - Priority areas for management and conservation action based on biodiversity value and ecosystem service delivery

5 BOSMAP IMPLEMENTATION

The BOSMaP is primarily a source of detailed environmental information, and there are a multitude of applications for this. The information contained in this document and in the GIS database accompanying it, can be used in any number of ways:

1. **Assessment of land under application for development** - The BOSMaP can provide detailed environmental information that is required by municipal decision makers regarding land that is under application for development. The BOSMaP will be able to provide information such as the vegetation type occurring on site, the conservation status of that vegetation type, the relative importance of the habitat on the site and some of the important species likely to occur there. In addition the BOSMaP will be able to provide information regarding the important ecosystem services being provided by an area.

   The following recommendations (Table 4) are provided to guide the municipality in the use of the BOSMaP information during decision making regarding applications for developments which impact on untransformed land in the municipality.

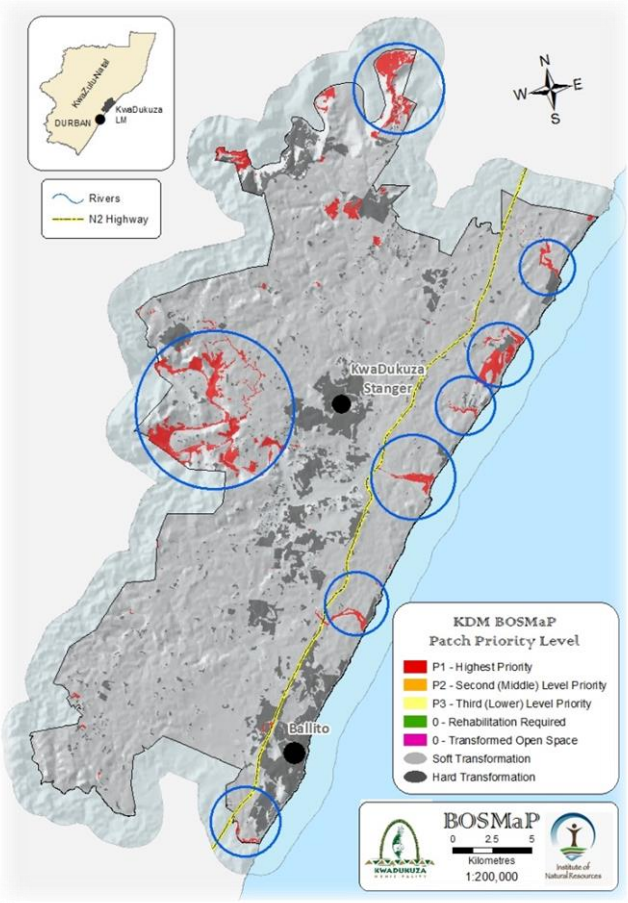
   Note: *The BOSMaP does not take the place of any formal environmental assessment required by the National Environmental Management Act, but is able to provide the municipality with a good understanding of what important features are likely to be impacted by proposed developments and provide a good understanding of which areas are likely to host important biodiversity and ecosystem service areas.*

Table 4 - Recommendations regarding BOSMaP priority areas

Priority Level	Implication of loss	Recommendation
P1	Critical biodiversity and strategically important ecosystem services are likely to be impacted or lost. Municipal targets for contributions to provincial conservation of biodiversity will be unable to be met.	It is recommended that **no development should negatively impact these areas.** If development is unavoidable or not likely to impact the untransformed areas, loss of identified critical habitats and service provision areas must be avoided, in-depth studies of impacted features and resident species should be carried out and comprehensive mitigation measures implemented to ensure that no loss of functionality is incurred. In these areas, ecosystem services should, where possible, be enhanced through the rehabilitation of degraded vegetation and through improvements in land management.
P2	Important biodiversity and ecosystem services are likely to be impacted or lost.	Development plans should **avoid these areas if at all possible**. Where development is unavoidable, developments should identify important features using the BOSMaP GIS database and site assessments and implement comprehensive mitigation measures to ensure biodiversity functionality (such as habitat integrity and ecosystem connectivity) and ecosystem service delivery are not compromised.
P3	Some biodiversity and ecosystem services are likely to be impacted or lost.	Developments in these areas should identify important biodiversity and ecosystem service delivery areas on the site using the BOSMaP GIS database and site assessments and then ensure that mitigation measures are put in place to minimize the impacts on these features.
P0 Rehabilitation required	Important functional area that has already been transformed	Developments planned in these areas must avoid the delineated functional zone. Rehabilitation measures should be undertaken to restore functionality.

2. **Strategic planning for management action** – The BOSMaP can be used to strategically focus efforts of open space management to areas where the most return can be gained for effort/cost expended.

   a. ***Prioritisation of areas for proclamation as protected areas***. KwaDukuza municipality currently has no formally protected areas. The BOSMaP is able to identify areas where biodiversity conservation will be most efficient (see summed irreplaceability), and other priority areas for conservation of critically endangered features.



   b. **Alien plant clearing**. Alien plant clearing is an important aspect of municipal management. The best return for cost expended can be obtained by focusing efforts in strategically important areas, where the presence of alien plants is most damaging to biodiversity and ecosystem services.

   This is illustrated in Figure 7 where areas that are important for water production and supply, estuarine functional zones and grasslands in good and fair condition have been prioritized for alien clearance based on the information stored in the BOSMaP attribute table.

Figure 7 - Suggested focal points for alien plant clearing operations

3. **Inclusion of a detailed spatial environmental framework in municipal planning** - This information should be used by the municipality to include important environmentally sensitive areas in the municipal planning framework such as through the municipal SDF or the expansion of the municipal open space network. Processes such as these will ensure the inclusion of the conservation of important areas in the municipal planning agenda.

6 SPECIFIC CONSERVATION PRIORITIES

Two features of specific conservation importance have been drawn out of this study for particular attention in the KwaDukuza municipal area. These are:

1) **Estuaries** – Estuaries have been highlighted as perhaps the most important biodiversity and ecosystem service features in the municipality. A broad study of each of the estuaries is included in the project report. It is imperative that the functional zone of all estuaries be protected, that estuaries be considered when any development threatens the quantity and quality of water reaching them and that a formal estuary management plan be developed to safeguard the functioning of these important features.
2) **Coastal grassland, lowland forest mosaic** - The conservation importance of the remnant patches of coastal grassland and lowland forest is illustrated by their listing as either critically endangered or endangered. Additionally, the forest/grassland ecotone (transition area where the two meet) is a vitally important part of both of these habitats and as such the mosaic of forest and grassland is seen as one critically important feature.

Given the regional importance of the grasslands and forests of KwaDukuza, the following recommendations are made:

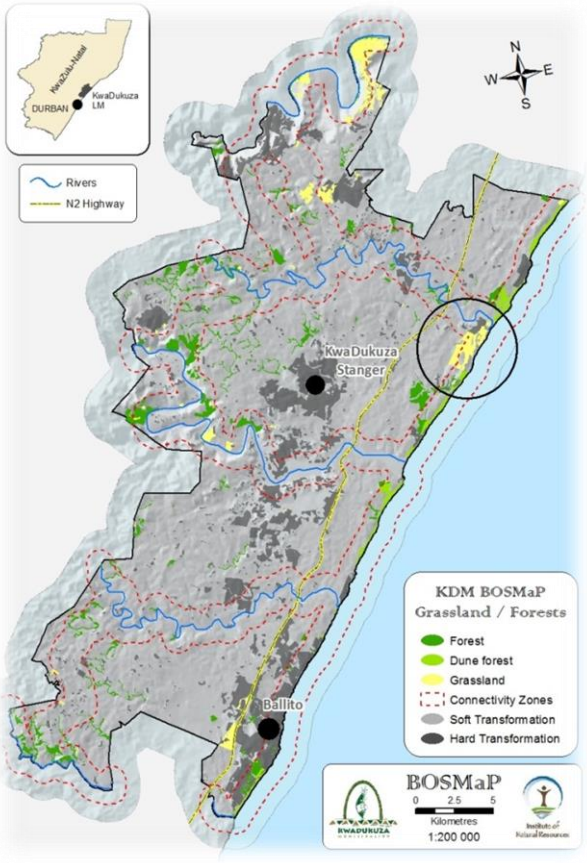


Figure 8 - Grassland and forest remnants in KwaDukuza Municipality

1. The protection of grasslands and forests should be prioritized by the municipal environmental department, particularly where they share a common boundary.

2. It is most important that remaining coastal grassland areas in a good or fair condition be urgently secured. In particular the patch of coastal grassland just south of the Nonoti estuary (circled in Figure 8 alongside and illustrated in Figure 9 below) is the last remaining fragment of coastal belt grassland / dune thicket mosaic in the municipality. Every effort must be made to secure, not only the portion in good condition, but also the area of fair condition grassland adjacent to it. Conservation options for areas on private or tribal land are acknowledged to be limited, however the KZN Stewardship Programme offers viable options that have been proven in other areas of the province.

Figure 9 - Areas of 1) Good and 2) Fair grassland to the South of the Nonoti Estuary

3. Grassland and forest ecotones should where possible be kept free of alien invasive plants by strategically targeted efforts that are sustained over several seasons.

4. Where fire is used to manage grasslands or other areas sharing a boundary with forests, fires should be put in at the forest / grassland edge, forcing the fire to burn away from the forest

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