

VEGETATION AND FLORA ASSESSMENT: Tintswalo Property Group Escourt Hospital site, south- west of Estcourt, KwaZulu-Natal Province



**David Hoare
Consulting cc**

PREPARED BY:
Dr David Hoare
Postnet Suite #116
Private Bag X025
Lynnwood Ridge, 0040
tel: (012) 804 2281
fax: 086 550 2053
e-mail: dhoare@lantic.net



PREPARED FOR:
Seaton Thomson Associates
PO Box 936,
Irene, 0062
Tel: (012) 667-2107
Fax: (012) 667- 2109

Declaration of Independence & Summary of Expertise

Appointment of specialist

David Hoare of David Hoare Consulting cc was commissioned by Seaton Thomson Associates to provide specialist consulting services for the Environmental Impact Assessment for a proposed development

of the Estcourt Hospital site for the Tintswalo Property Group, south-west of Estcourt in KwaZulu-Natal Province. The consulting services comprise a description of the flora and vegetation in the study area.

Contact details

Dr David Hoare
David Hoare Consulting cc
Postnet Suite no. 116
Private Bag X025
Lynnwood Ridge, 0040

Telephone: 012 804 2281
Cell: 083 284 5111
Fax: 086 550 2053
Email: dhoare@lantic.net

Summary of expertise

Dr David Hoare:

- Dr Hoare has majors in Botany and Zoology from Rhodes University, Grahamstown, an Honours Degree in Botany from Rhodes University, an MSc from the Department of Plant Science, University of Pretoria, and a PhD in Botany from the Nelson Mandela Metropolitan University, Port Elizabeth.
- Registered professional member of The South African Council for Natural Scientific Professions (Ecological Science, Botanical Science), registration number 400221/05.
- Founded David Hoare Consulting cc, an independent consultancy, in 2001.
- Ecological consultant since 1995, with working experience in Gauteng, Mpumalanga, Limpopo, North West, Eastern Cape, Western Cape, Northern Cape and Free State Provinces, Tanzania, Kenya, Botswana, Mozambique and Swaziland.
- Conducted, or co-conducted, over 350 specialist ecological surveys as an ecological consultant. Areas of specialization include general ecology, biodiversity assessments, vegetation description and mapping, plant species surveys and remote sensing of vegetation. Has undertaken work in grassland, thicket, forest, savannah, fynbos, coastal

vegetation, wetlands and nama-karoo vegetation, but has specific expertise in grasslands and wetland vegetation.

- Published six technical scientific reports, 15 scientific conference presentations, seven book chapters and eight refereed scientific papers.
- Attended 15 national and international congresses & 5 expert workshops, lectured vegetation science / ecology at 2 universities and referee for 2 international journals.

Independence

David Hoare Consulting cc and its Directors have no connection with the proponent. David Hoare Consulting cc is not a subsidiary, legally or financially, of the proponent. Remuneration for services by the proponent in relation to this project is not linked to approval by decision-making authorities responsible for authorising this proposed project and the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project. David Hoare is an independent consultant to Seaton Thomson and Associates and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work.

Indemnity and conditions relating to this report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. David Hoare Consulting cc and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

Contents

Declaration of Independence & Summary of Expertise	1
<i>Appointment of specialist</i>	<i>1</i>
<i>Contact details</i>	<i>1</i>
<i>Summary of expertise</i>	<i>1</i>
<i>Independence.....</i>	<i>2</i>
<i>Indemnity and conditions relating to this report</i>	<i>2</i>
Introduction	5
<i>Terms of reference and approach</i>	<i>5</i>
Methodology	7
<i>Assessment philosophy for this study</i>	<i>7</i>
<i>Vegetation survey</i>	<i>8</i>
<i>Red List plant species</i>	<i>9</i>
<i>Protected trees.....</i>	<i>10</i>
<i>Sensitivity assessment.....</i>	<i>10</i>
Description of study area	13
<i>Study area</i>	<i>13</i>
Location	13
Topography.....	14
Soils and rainfall.....	15
Landuse and landcover	15
<i>Regional vegetation patterns in relation to the site</i>	<i>16</i>
KwaZulu-Natal Highland Thornveld	16
Thukela Thornveld	17
<i>Vegetation conservation status</i>	<i>18</i>
National status.....	18
Provincial conservation plan status	18
<i>Potential occurrence of flora species of conservation concern for the study area.....</i>	<i>20</i>
<i>Protected trees.....</i>	<i>22</i>

Vegetation patterns on site 24

Flora of the site 25

Disturbance on site 25

Wet areas on site 26

Sensitivity assessment..... 26

Discussion**28**

Recommendations**29**

Conclusion.....**31**

References**32**

Appendix 1: Red / Orange List plant species recorded within the quarter degree within which the study area is situated, namely 2929BB.**34**

Appendix 2: Provisional checklist of plant species found on the site**38**

Appendix 3: Plant species previously recorded in the grid in which the site is located.**42**

Appendix 2: List of protected tree species (National Forests Act).....**47**



Introduction

This document presents the results of the flora and vegetation assessment of the study site, based on a desktop and field assessment, as well as mapping from aerial imagery.

On 23 October 2015 David Hoare Consulting cc was appointed by Seaton Thomson & Associates to undertake a description and assessment of the flora and fauna in the study area.

The requirement of the study was to assess the sensitivity of the vegetation of the site and to assess the possibility of any threatened or protected plant species occurring there.

Terms of reference and approach

The intention of the study was to provide a description of potentially sensitive vegetation or plant species on site that may be negatively impacted by development of the site. The study was to include a site visit to assess the habitat on site with the view of making judgements on:

1. the condition of the vegetation on site;
2. the sensitivity and conservation value of vegetation on site;
3. the suitability of habitat for threatened plant species.

The study was to cover the remaining areas of natural vegetation on the site. The following information was to be provided in the report:

- To provide a description of the broad vegetation types and/or habitats for the area, including any areas of potential conservation value. This will be based on published sources, including the vegetation map of South Africa (Mucina et al. 2006), the National Spatial Biodiversity Assessment and any Biodiversity Conservation Plans that exist for Gauteng Province.
- To provide the national conservation status of major vegetation types in which the study sites are located, as listed in The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).
- To provide an assessment of the Red and Orange List (threatened, near threatened and declining) flora species within KwaZulu-Natal Province and more specifically those that could occur in the project study area, including information on habitats in which they are most likely to be encountered.
- To investigate the potential presence of trees protected according to the National Forests Act and flora protected under the National Environmental Management: Biodiversity Act.
- To provide a list of the declared weeds or alien invader species on site, as listed according to the Conservation of Agricultural Resources Act (Act No.43 of 1983). In terms of this Act 198 alien species are listed as declared weeds and invaders and ascribed to one of the following categories:
 - **Category 1:** Prohibited and must be controlled.

- **Category 2** (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- **Category 3** (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.
- To compile an assessment and preliminary map of the general status of vegetation on site in order to provide a description of which areas contain natural habitat versus those that are transformed and/or degraded.
- To list and describe potential impacts on biodiversity, sensitive habitats and ecosystem function.



Methodology

Assessment philosophy for this study

Sites vary in their natural character and uniqueness and the level to which they have been previously disturbed. Assessing the potential impacts of a proposed development often requires evaluating the conservation value of a site relative to other natural areas and relative to the national importance of the site in terms of biodiversity conservation. A simple approach to evaluating the relative importance of a site includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on the site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?

Thus, the general approach adopted for this type of study is to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws. Biodiversity issues are assessed here by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. These can be organized in a hierarchical fashion, as follows:

Species

1. threatened plant species
2. protected trees

Ecosystems

1. threatened ecosystems
2. protected ecosystems
3. critical biodiversity areas
4. areas of high biodiversity
5. centres of endemism

Processes

1. corridors
2. mega-conservancy networks
3. rivers and wetlands
4. important topographical features

It is not the intention to provide comprehensive lists of all species that occur on site, since most of the species on these lists are usually common or widespread species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which are most likely to be significantly negatively affected if development occurs. The focus on national and provincial priorities and critical biodiversity issues is in line with National legislation protecting environmental and biodiversity resources.

Vegetation survey

Fieldwork for this study was conducted on 3 February 2016. The entire site was traversed on foot and species recorded as they were encountered. It was attempted to cover all natural variation that occurred on site as well as to cover as much of the site as possible. An indication of the route walked during the field survey is shown in Figure xxxxx. Attention was paid to determining whether the species composition and vegetation structure in particular parts of the site was indicative of natural vegetation or not, the primary purpose being to highlight any areas of natural grassland as having higher conservation value versus areas of secondary or degraded vegetation.

A checklist of species occurring on site was collected and the site was investigated in detail in order to ensure that all parts were covered during the survey. The site was traversed by foot and species listed as they were encountered. Plant names follow Germishuizen *et al.* (2005). Due to the brief duration of the survey, the species list provided for the area cannot be regarded as comprehensive, but due to the season of the survey it is likely that many of species present on site were identifiable at the time of the survey.



Red List plant species

A list of Red List flora species which could potentially occur within the study area was compiled on the basis of existing data from SANBI (refer to Appendix 1). South Africa has adopted the IUCN Red List Categories and Criteria to provide an objective, rigorous, scientifically founded system to identify Red List species. A published list of the Red List species of South African plants (Raimondo et al. 2009) contains a list of all species that are considered to be at risk of extinction. This list is updated regularly to take new information into account, but these are not published in book/paper format. Updated assessments are provided on the SANBI website (<http://redlist.sanbi.org/>). According to the website of the Red List of Southern African Plants (<http://redlist.sanbi.org/>), the conservation status of plants indicated on the Red List of South African Plants Online represents the status of the species within South Africa's borders. This means that when a species is not endemic to South Africa, only the portion of the species population occurring within South Africa has been assessed. The global conservation status, which is a result of the assessment of the entire global range of a species, can be found on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species: <http://www.iucnredlist.org>. The South African assessment is used in this study.

The purpose of listing Red List plant species is to provide information on the potential occurrence of species at risk of extinction in the study area that may be affected by the proposed infrastructure. Species appearing on these lists can then be assessed in terms of their habitat requirements in order to determine whether any of them have a likelihood of occurring in habitats that may be affected by the proposed infrastructure.

Lists were compiled specifically for any species at risk of extinction (Red List species) previously recorded in the area. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute (<http://posa.sanbi.org>) for the quarter degree square/s within which the study area is situated. Habitat information for each species was obtained from various published sources. The probability of finding any of these species will then be assessed by comparing the habitat requirements with those habitats that occur on site.

The list was evaluated to determine which species were likely to occur in the available habitats in the study area. Detailed searches were undertaken on site to try to locate any of the species on site. For all listed plant species that occur in the general geographical area of the site, a rating of the likelihood of it occurring on site is given as follows:

LOW: no suitable habitats occur on site / habitats on site do not match habitat description for species;

MEDIUM: habitats on site match general habitat description for species (e.g. grassland), but detailed microhabitat requirements (e.g. rocky grassland on shallow soils overlying dolomite) are absent on the site or are unknown from the descriptions given in the literature or from the authorities;

HIGH: habitats found on site match very strongly the general and microhabitat description for the species (e.g. rocky grassland on shallow soils overlying dolomite);

DEFINITE: species found on site.

Protected trees

Regulations published for the National Forests Act (Act 84 of 1998) as amended, provide a list of protected tree species for South Africa. The species on this list were assessed in order to determine which protected tree species have a geographical distribution that coincides with the study area and habitat requirements that may be met by available habitat in the study area. The distributions of species on this list were obtained from published sources (e.g. van Wyk & van Wyk 1997) and from the SANBI Biodiversity Information System website (<http://sibis.sanbi.org/>) for quarter degree grids in which species have been previously recorded. Species that have been recorded anywhere in proximity to the site (within 100 km), or where it is considered possible that they could occur there, were listed and were considered as being at risk of occurring there. The site was searched for these species during the field survey and any individuals or concentrations noted.

Sensitivity assessment

The purpose of producing a habitat sensitivity map is to provide information on the location of potentially sensitive features in the study area. This was compiled by taking the following into consideration:

1. The general status of the vegetation of the study area was derived by compiling a landcover data layer for the study area (*sensu* Fairbanks et al. 2000) using available satellite imagery and aerial photography. From this it can be seen which areas are likely to be transformed versus those that are still in a natural status. This status stratification was then verified in the field using on-the-ground information on species composition and vegetation structure.
2. Various provincial, regional or national level conservation planning studies have been undertaken in the area, e.g. Gauteng C-Plan version 3. The mapped results from these were taken into consideration in compiling the habitat sensitivity map.
3. Habitats in which various species occur that may be protected or are considered to have high conservation status are considered to be sensitive.

An explanation of the different sensitivity classes is given in Table 1. Areas containing untransformed natural vegetation that is important for Red List organisms are considered potentially sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to potentially have low sensitivity.

Table 1: Explanation of sensitivity ratings.

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
"NO-GO" areas	<p>Indigenous natural areas that are highly positive for the following:</p> <ul style="list-style-type: none"> • presence of habitats critical for the survival of populations of threatened species (Critically Endangered, Endangered, Vulnerable). 	<ul style="list-style-type: none"> • Confirmed presence of habitats essential for the survival of populations of threatened species.
HIGH	<p>Indigenous natural areas that are highly positive for <u>any</u> of the following:</p> <ul style="list-style-type: none"> • presence of threatened species (Critically Endangered, Endangered, Vulnerable). <p>And may also be positive for the following:</p> <ul style="list-style-type: none"> • <u>High</u> intrinsic biodiversity value (<u>high</u> species richness and/or turnover, unique habitat) • presence of habitat highly suitable for threatened species (Critically Endangered, Endangered, Vulnerable species). • <u>Low</u> ability to respond to disturbance (low resilience, dominant species very old). 	<ul style="list-style-type: none"> • Confirmed presence of populations of threatened species. • Habitat where a threatened species could potentially occur (habitat is suitable, but no confirmed records). • Confirmed habitat for species of lower threat status (near threatened, rare). • Habitat where a species of lower threat status (e.g. (near threatened, rare) could potentially occur (habitat is suitable, but no confirmed records). • Habitat with exceptionally high diversity (richness or turnover). • Habitat with unique species composition and narrow distribution.
MEDIUM	<ul style="list-style-type: none"> • Other indigenous natural areas in which factors listed above are of no particular concern. 	

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
	<ul style="list-style-type: none">• May also include natural buffers around ecologically sensitive areas and natural links or corridors in which natural habitat is still ecologically functional.• Degraded or disturbed indigenous natural vegetation. May also include secondary vegetation in an advanced state of development in which habitat is still ecologically functional and which could potentially provide habitat for species of concern.	
LOW	No natural habitat remaining.	

Description of study area

This section provides a description of the location of the study area as well as an outline of the background biodiversity information known for the study area. It includes information collected during the field survey of the site.

Study area

Location

The site of the proposed development is to the south-west of the CBD of Estcourt and just to the south of Rolland Hellet Avenue (Figure 2). There is a small stream running across the north of the study area, which is between the site and the urban areas of Estcourt, and a hill rising to the south,

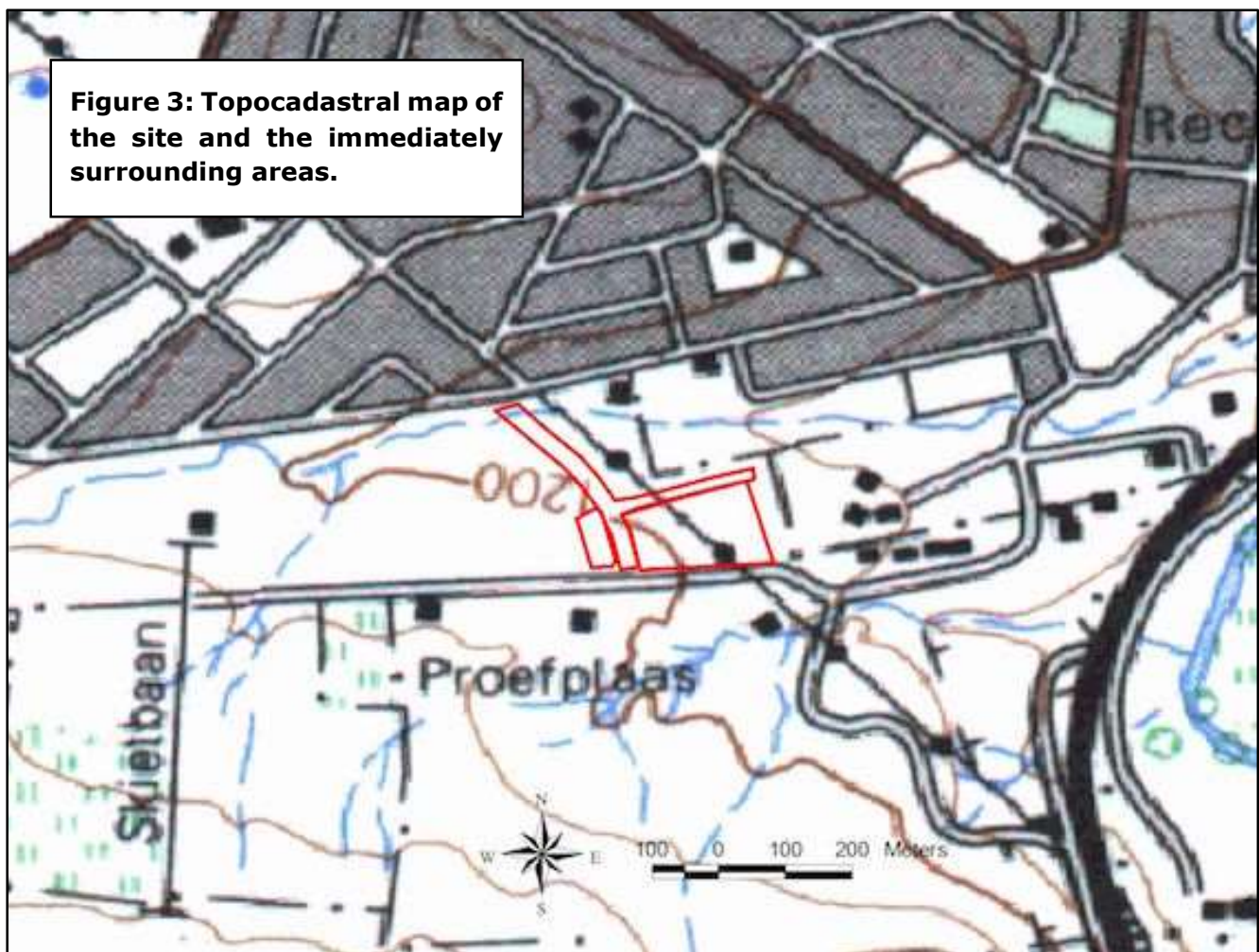


beyond which is natural areas. On the eastern side is a small cluster of buildings and to the west is open vegetation (Figure 2). An existing gravel road (jeep track) runs through the site to a shooting range located approximately 600 m to the west. This gravel track is just outside the southern boundary of the site. Immediately across this gravel track is an area of informal agriculture. The site is within the quarter degree grid 2929BB.

There are three components to the proposed project, namely the hospital site (shown as an orange line in Figure 2), the access road (green) and a residential components (yellow). The access road is planned to cross the stream at the site of an existing power-line, whereas the hospital site and residential area are within a wooded grassland area.

Topography

The study area is situated on a moderately undulating landscape. The landscape slopes gently towards the north-east, towards the stream on the northern side as well as towards the east. The



site is at an elevation of approximately 1189–1205 m. The highest point is on the south-eastern corner of the site and the lowest part is on the north-western corner.

Soils and rainfall

The land type of the site, which is an area with largely uniform soils, topography and climate, is the Fa land type (MacVicar et al. 1974, Land Type Survey Staff, 1987).

Unit F indicates pedologically young landscapes that are not predominantly rock and nor predominantly alluvial or aeolian and in which the dominant soil-forming processes have been rock weathering, the formation of orthic topsoil horizons and, commonly, clay illuviation, giving rise typically to lithocutanic horizons. The soil forms that epitomise these processes are Glenrosa and Mispah. However, exposed rock and soils belonging in almost any of the other 39 soil forms may be found in these land types, provided these other soils do not qualify the land for inclusion in another map unit (MacVicar et al. 1974). The Fa unit indicates land types land in which lime in the soil is not encountered regularly in any part of the landscape (MacVicar et al. 1974).

The soils on site are generally quite shallow and associated with either shale or dolerite, with dolerite outcropping in a semi-circular band on site.

The rainfall in the study area is approximately 720-750 mm per annum and occurs mainly in the summer (Dent et al. 1989). This is mainly in the form of thunderstorms, of which Estcourt has approximately 56 thunderstorm days per year. Summers are warm to hot and winters are cool, with up to 15 frost days per year.

Landuse and landcover

There is currently no formal urban infrastructure within the site, but there are indications that the site has been impacted by previous activities on site, including the existence of a berm built of loose stones that runs more-or-less along the northern boundary of the site. There is a power line running across the site.

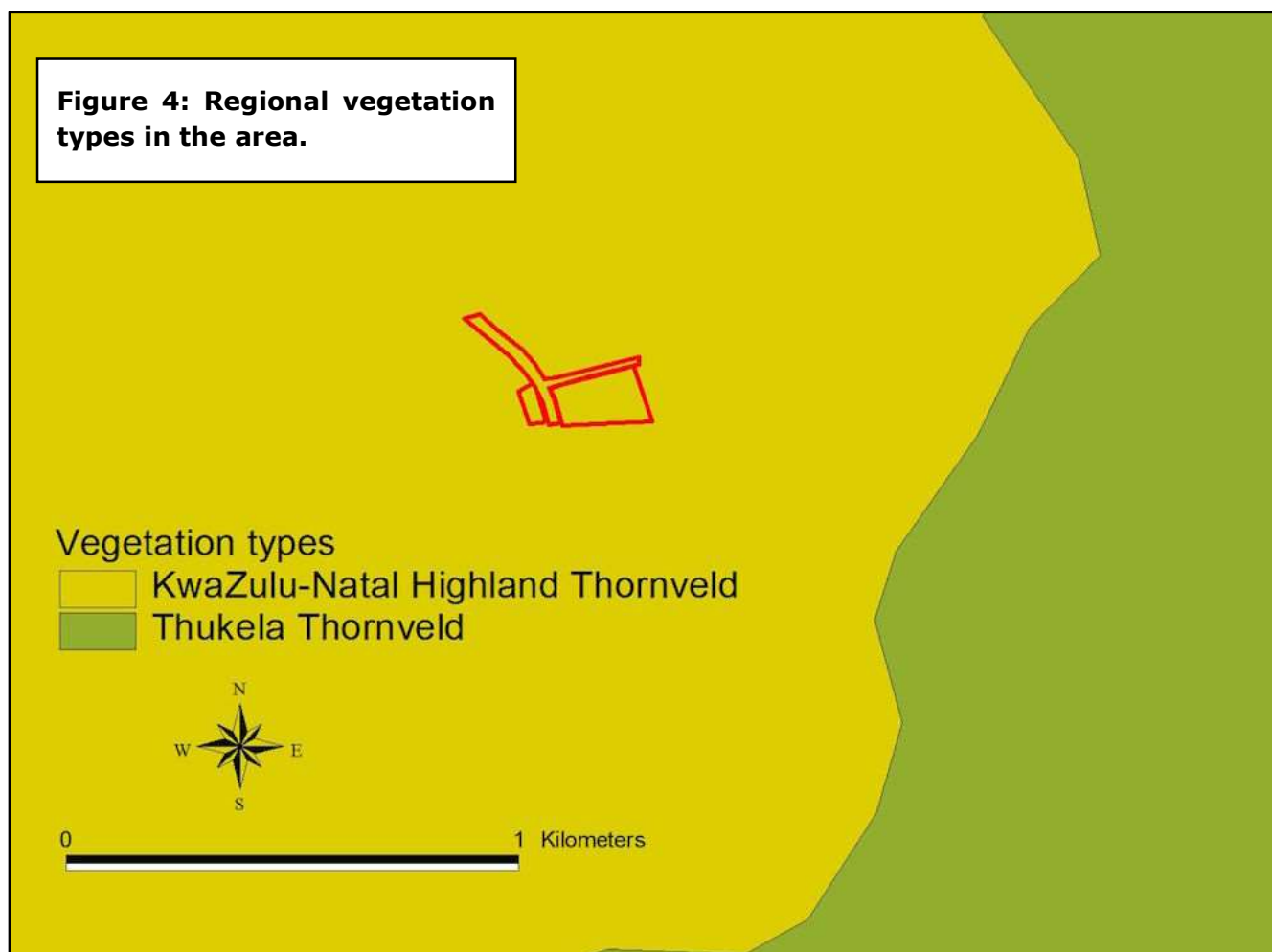
The patterns indicated on the Surveyor-General's 1:50 000 topo-cadastral map of the area that includes the site (Figure 3, previous page) shows that none of the site was previously cultivated. No other infrastructure is shown on this map for this site, but it is shown as being part of an experimental farm and the gravel track is shown, indicating that the track has existed for some time. Historical Google imagery for the site does not extend far back in time, but indicates no significant disturbance that is not evident from current patterns.

Regional vegetation patterns in relation to the site

According to the vegetation map of the country (Mucina et al., 2005) the study area falls within one regional vegetation type, KwaZulu-Natal Highland Thornveld. Another vegetation type, Thukela Thornveld, is found a short distance to the east of the site, but according to the vegetation map, does not occur on site (Figure 4). There is, however, the possibility that floristic and structural influences will be evident on site from the second vegetation type. The Provincial Vegetation Map shows essentially the same pattern, but includes wetland areas as map units, none of which occur directly on site, but one of which, Temperate Alluvial Vegetation, is found directly to the west of the site.

KwaZulu-Natal Highland Thornveld

The KwaZulu-Natal Highland Thornveld vegetation type is found only in KwaZulu-Natal in a series of several patches in the central-northern regions of the province, where it occurs on both dry



valleys and moist upland (Mucina et al. 2006). The most extensive area is found in the region from Ladysmith, Winterton, Estcourt and Colenso, between Mooi River and Greytown, between Pomeroy and Babanago, and further north in a triangle between Vryheid, Paulpietersburg and Louwsburg as well as a large patch around Newcastle. It is found in hilly, undulating landscapes and broad valleys. The vegetation structure is a tall tussock grassland usually dominated by *Hyparrhenia hirta*, with occasional savannoid woodlands with scattered *Acacia sieberiana* var. *woodii* and in small pockets with *Acacia karroo* and *Acacia nilotica*. The presence of sparse woodlands with *Acacia* were traditionally considered to be a management problem and ascribed to 'bush encroachment'. The vegetation unit has, however, always been a natural mosaic of open tall grassland and sparse woodland with progressive encroachment of woody elements into grassland, especially in heavily disturbed areas. Fire is probably a critical feature in shaping the relationship between grasses and thorn trees.

Important taxa are listed as the small trees, *Acacia sieberiana* var. *woodii*, *Acacia natalitia*, *Acacia nilotica*, *Cussonia spicata* and *Ziziphus mucronata*, the tall shrub, *Dichrostachys cinerea*, the low shrubs, *Barleria obtusa*, *Anthospermum rigidum* subsp. *pumilum*, *Chaetacanthus setiger*, *Gymnosporia heterophylla*, the semiparasitic shrublet, *Thesium costatum*, the graminoids, *Abildgaardia ovata*, *Andropogon eucomis*, *Aristida bipartita*, *Aristida congesta*, *Chloris virgata*, *Cynodon dactylon*, *Elionurus muticus*, *Eragrostis capensis*, *Eragrostis chloromelas*, *Eragrostis plana*, *Eragrostis racemosa*, *Eragrostis superba*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Setaria sphacelata*, *Themeda triandra*, *Tristachya leucothrix* and others, the herbs, *Hermannia depressa*, *Becium filamentosum*, *Chamaecrista mimosoides*, *Euryops transvaalensis*, *Haplocarpha scaposa*, *Helichrysum rugulosum* and various others.

Thukela Thornveld

The Thukela Thornveld vegetation type is found only in KwaZulu-Natal in the Upper Thukela River basin fringing Thukela Valley Bushveld on its upper border in a series of discontinuous patches (Mucina et al. 2006). The largest area is east of Estcourt-Colenso and including Ladysmith. There are also some outliers on slopes south of Dundee. It is found most often on valley slopes and undulating hills. The vegetation is a *Acacia*-dominated bushveld of variable density ranging from wooded grassland to dense thickets. It has a dense grassy undergrowth.

Important taxa are listed as the small trees, *Acacia natalitia*, *Acacia nilotica*, *Acacia sieberiana* var. *woodii*, *Acacia tortilis* subsp. *heteracantha*, *Allophylus melanocarpus*, *Boscia albitrunca*, *Clausena anisata*, *Cussonia spicata*, *Dais cotinifolia* and *Ziziphus mucronata*, the tall shrubs, *Coddia rudis*, *Buddleja saligna*, *Clerodendron glabrum*, *Euclea crispa* subsp. *crispa*, *Heteromorpha arborescens* var. *abyssinica*, *Hibiscus calyphyllus*, *Lippia javanica*, *Pachystigma macrocalyx*, *Rhus pentheri*, and *Rhus rehmanniana*, the low shrubs, *Barleria obtusa* and *Justicia flava*, the soft shrub, *Peristrophe cernua*, the woody succulent climber, *Senecio brachypodus*, the graminoids, *Eragrostis curvula*, *Panicum maximum*, *Hyparrhenia hirta*, *Melinis repens*, *Themeda triandra*, *Tristachya leucothrix* and others, the herbs, *Osteospermum muricatum*, *Sansevieria hyacinthoides*, *Aloe mudenensis* and various others

Vegetation conservation status

National status

The conservation status of Soweto Highveld Grassland is Endangered (Driver et al., 2005 and Mucina et al., 2006), and whilst the conservation target is 24%, approximately 0.2% is currently protected and 47% is considered to be transformed (Mucina & Rutherford, 2006). Only a handful of patches statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site). Almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have been flooded by dams (Grootdraai, Leeuwkuil, Trichardtsfontein, Vaal, Willem Brummer). Erosion is generally very low.

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists national vegetation types that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature. Soweto Highveld Grassland is listed as Vulnerable in the "National List of Ecosystems that are Threatened and need of protection" (GN1002 of 2011).

Provincial conservation plan status

There is one main aspect management plan for the province, namely the KwaZulu-Natal Systematic Conservation Plan (KZNSCP). This is composed of three separate components, as follows:

- KZN Marine Systematic Conservation Plan 2012;
- KZN Freshwater Systematic Conservation Plan 2007;
- KZN Terrestrial Systematic Conservation Plan 2011.

The KZN Terrestrial Systematic Conservation Plan relies on the accurate definition of vegetation patterns, species data, ecological processes and threats as well as knowledge of the extent and location of transformation. For vegetation types, Ezemvelo KZN Wildlife has developed a vegetation map with vegetation types that differ from the National Vegetation Map.

Using the latest provincial vegetation map, accumulated transformation maps of the province and the biodiversity conservation targets for vegetation types, the conservation status for all the vegetation types were calculated. Critical Biodiversity Areas (CBAs) and Critical Ecological Support Areas (CESAs) were then identified. CBAs are considered significant and need to be kept in a near natural state to ensure the continued functioning of ecosystems. A CBA represents the best choice for achieving biodiversity targets. CESAs are not essential for achieving targets, but they play a vital role in the continued functioning of ecosystems. The Conservation Plan map has the following legend and categories:

- Critical Biodiversity Area 1 Mandatory

The CBA 1 Mandatory areas are based on the C-Plan Irreplaceability analysis and have been identified as having an Irreplaceability value of 1. These planning units represent the only localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved i.e. there are no alternative sites available.

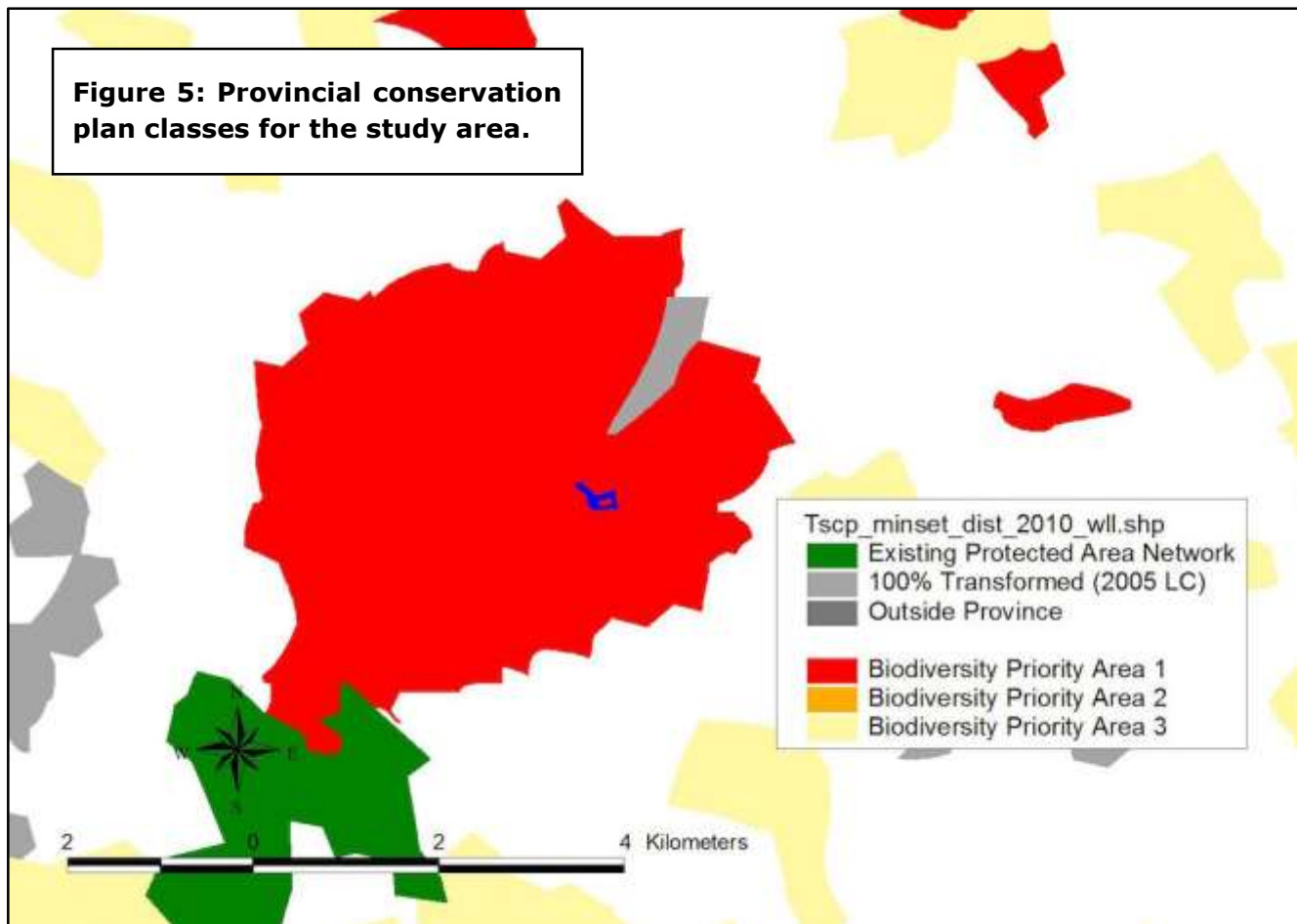
- Critical Biodiversity Area 2 Mandatory

CBA2 indicate the presence of one (or more) features with a very high irreplaceability score. In practical terms, this means that there are alternate sites within which the targets can be met, but there aren't many. This site was chosen because it represents the most optimal area for choice in the systematic planning process, meeting both the target goals for the features concerned, as well as a number of other guiding criteria such as high agricultural potential area avoidance, falls within a macro-ecological corridor etc.

- Critical Biodiversity Area 3 Optimal

CBA3 indicate the presence of one (or more) features with a low irreplaceability score. Derived in the same way as outlined for CBA2 described above, the determination vision of these PU's is driven primarily by the guiding layers.

- Biodiversity Area



These are other natural areas that do not fall within any of the CBA classes above, but may still contain important biodiversity features.

- Protected Areas

Any formally protected area.

- Transformed Areas

These are areas which are 100% transformed according to the KwaZulu-Natal landcover 2005 coverage.

The study area contains the following classes from the KZN Terrestrial Systematic Conservation Plan (see Figure 5 above):

- CBA 1: the entire study area falls within a CBA1 area.

Potential occurrence of flora species of conservation concern for the study area

There are 17 Red or Orange List plant species that have been recorded from the quarter degree grid in which the study site is situated. These species are listed in Appendix 1 together with their conservation status categories according to the IUCN Version 3.1 criteria (IUCN, 2001) and relevant information, such as habitat and distribution.

Of these 17 species, 16 were considered to have a medium to high chance of occurring in the type of habitats available in the study area (see Appendix 1). Of these 16 species, three are listed as Rare, ten are listed as Declining, five as Near Threatened, four as Vulnerable, two as Endangered and two as Critically Endangered.

Of most importance from a conservation point of view are the Vulnerable, Endangered and Critically Endangered species, *Barleria argillicola*, *Barleria greenii*, *Aloe inconspicua*, *Disa scullyi*, *Carex subinflata*, *Calpurnia woodii*, *Bowiea volubilis* subsp. *volubilis* and *Orbea woodii*. For all these species, except *Aloe inconspicua* and *Bowiea volubilis* subsp. *volubilis*, it was assessed that, based on habitat preference and known distribution data, it was unlikely that they would occur on site.

Aloe inconspicua occurs in Bushman's River Valley near Estcourt where it is found in the transition between grassland and valley bushveld, mostly in short grassland, generally on gently sloping ground beside large hills and in hilly thornveld. Site conditions match this description and the site is within close proximity to the Bushman's River. There is therefore a possibility that it could occur on site. The species is known from only four sub-populations, none of which includes the site. The species flowers in November.

Bowiea volubilis subsp. *volubilis* occurs at low and medium altitudes, usually along mountain ranges and in thickly vegetated river valleys, often under bush clumps and in boulder screes. It occurs in bushy kloofs inland in KwaZulu-Natal. Marginally suitable habitat on site includes any of the bush clumps on site. These were carefully searched and no individuals were found on site. There is, however, still the possibility that individuals could occur there undetected.

The Near Threatened species are *Aloe dominella*, *Aloe prinslooi*, *Elaeodendron transvaalense*, *Curtisia dentata* and *Merwillia plumbea*. The two aloes were the only two species considered to have

a probability of occurring on site. No plants resembling *Aloe dominella* were seen on site and it is considered unlikely to occur there. A population of spotted aloes was found on site (see Figure 6) that could potentially be one of three species, one of which is possibly *Aloe prinslooii*. They can only be distinguished using flowering material. *Aloe prinslooii* flowers from June to November.

The Rare plant species are *Asclepias oereophila*, *Helichrysum drakensbergensis* and *Vitellariopsis dispar*. None of these were considered to be likely to occur on site, primarily because the distribution and habitat requirements is very narrow and excludes conditions found on site or the geographical location of the site.

The Declining plant species are *Crinum bulbispermum*, *Crinum macowanii*, *Ilex mitis* var. *mitis*, *Aloe cooperi* subsp. *cooperi* (currently listed as LC), *Elaeodendron croceum*, *Pterocelastrus rostratus*, *Sandersonia aurantiaca*, *Gunnera perpensa*, *Hypoxis hemerocallidea* and *Rapanea melanophloeos*.



Figure 6: Spotted aloe found on site.

Three of these species were found on site, namely *Crinum bulbispermum*, *Pterocelastrus rostratus* and *Hypoxis hemerocallidea*.

A total of approximately 20 individuals of the bulbous geophyte, *Crinum bulbispermum*, were found on site, mostly in the north-western corner of the site near to the floodplain of the stream. This is also a protected species.

Three small plants of the tree, *Pterocelastrus rostratus*, were found on site. Parts of the site appear to have been burnt during the last winter and some of the woody plants appear to have been burnt down to stumps. The three plants that were seen were all less than 30 cm tall and appeared to be coppicing from a burnt stump. The identity of the species is not definite, but it was the best that could be achieved with the small amount of available plant material.

A large population of the geophyte, *Hypoxis hemerocallidea*, was found on site. Due to the large numbers of this species found on site, it was not possible to count each individual. An estimate was obtained by counting the individuals within a 10 x 10 m area, of which 64 were counted. The species was not equally dense across the site and there were places where none occurred. However, at least half the site contained high densities, such as was counted in the sample square. Based on this count, the total area of the site (approximately 32 000 m²) and the relative distribution of the species on site, it is estimated that in excess of 10 000 individuals probably occur on site.

Protected trees

Tree species protected under the National Forest Act are listed in Appendix 2. Those that have a geographical distribution that includes the study area are *Catha edulis*, *Curtisia dentata*, *Elaeodendron transvaalense*, *Ocotea bullata*, *Pittosporum viridiflorum*, *Podocarpus falcatus*, *Podocarpus henkelii*, *Podocarpus latifolius* and *Prunus africana*.

- The tree *Catha edulis* occurs in bushveld associated with evergreen forests, often in rocky places. No suitable habitat occurs on site and no individuals were found during the field survey. It is considered highly unlikely that it occurs on site.
- The tree *Curtisia dentata* occurs in evergreen forests, on grassy mountain slopes and as a small tree in coastal scrub forest. Marginally suitable habitat occurs on site. No individuals were found during the field survey. It is considered unlikely that it occurs on site.
- The tree *Elaeodendron transvaalensis* occurs in bushveld, occasionally on termitaria or along streams. Potentially suitable habitat occurs in the study area. It is considered possible that it occurs in the study area. No individuals were found during the field survey.
- The tree *Ocotea bullata* occurs in montane forest. Potentially suitable habitat occurs in the study area. No suitable habitat occurs on site and no individuals were found during the field survey. It is considered highly unlikely that it occurs on site.
- The tree *Pittosporum viridiflorum* occurs in a wide range of altitudes along forest margins, in bush clumps and in bushveld, in deciduous woodland, in riverine fringe thicket, and often on rocky outcrops. Marginally suitable habitat occurs on site. No individuals were found during the field survey. It is considered unlikely that it occurs on site.
- The tree *Podocarpus falcatus* occurs in afro-montane forest, occasionally in coastal and sand forest. It may also occur in wooded ravines, mountain forest patches and coastal swamp

forest. No suitable habitat occurs on site and no individuals were found during the field survey. It is considered highly unlikely that it occurs on site.

- The tree *Podocarpus henkelii* occurs in moist, evergreen mountain forests and, less commonly, in coastal forests. No suitable habitat occurs on site and no individuals were found during the field survey. It is considered highly unlikely that it occurs on site.
- The tree *Podocarpus latifolius* occurs in Afromontane and coastal forest and also on exposed mountainsides where it is usually low-growing and stunted. No suitable habitat occurs on site and no individuals were found during the field survey. It is considered highly unlikely that it occurs on site.
- The tree *Prunus africana* occurs in montane forest, usually in mistbelt areas. No suitable habitat occurs in the study area and no individuals were found during the field survey. It is considered very unlikely that it occurs on site.

Based on habitat preferences, most of these species would only occur in closed woodland or forest-type habitat, which does not occur on site. Only one of these species could potentially occur in the types of habitats that are available on site, but no individuals were found on site. It is therefore concluded that no protected tree species are likely occur on site or were found there.



Figure 7: Typical view of vegetation on site.

Vegetation patterns on site

The site consists primarily of wooded grassland. There is a stream at the northern side in which riparian woodland occurs, but this consists entirely of alien trees and would probably have been sedges, rushes and hygrophilous grassland with some woody plants along the margins in the absence of the alien plants. There are areas on site in which there are outcroppings of small dolerite stones and other parts where the surface is free of stones. The bottomlands adjacent to the stream, as well as random patches on site, are dominated by tall grasses. There are therefore three main natural ecological units on site, wooded grasslands, tall (floodplain) grassland and riparian habitat.

The main wooded grassland areas are dominated by the grasses, *Eragrostis curvula*, *Brachiaria serrata*, *Themeda triandra*, *Tristachya leucothrix* and *Cymbopogon pospischilli*, and the herbaceous species, *Hypoxis hemerocallidea*, *Gerbera ambigua*, *Rhynchosia adenodes*, *Ledebouria revoluta*, *Helichrysum rugulosum*,

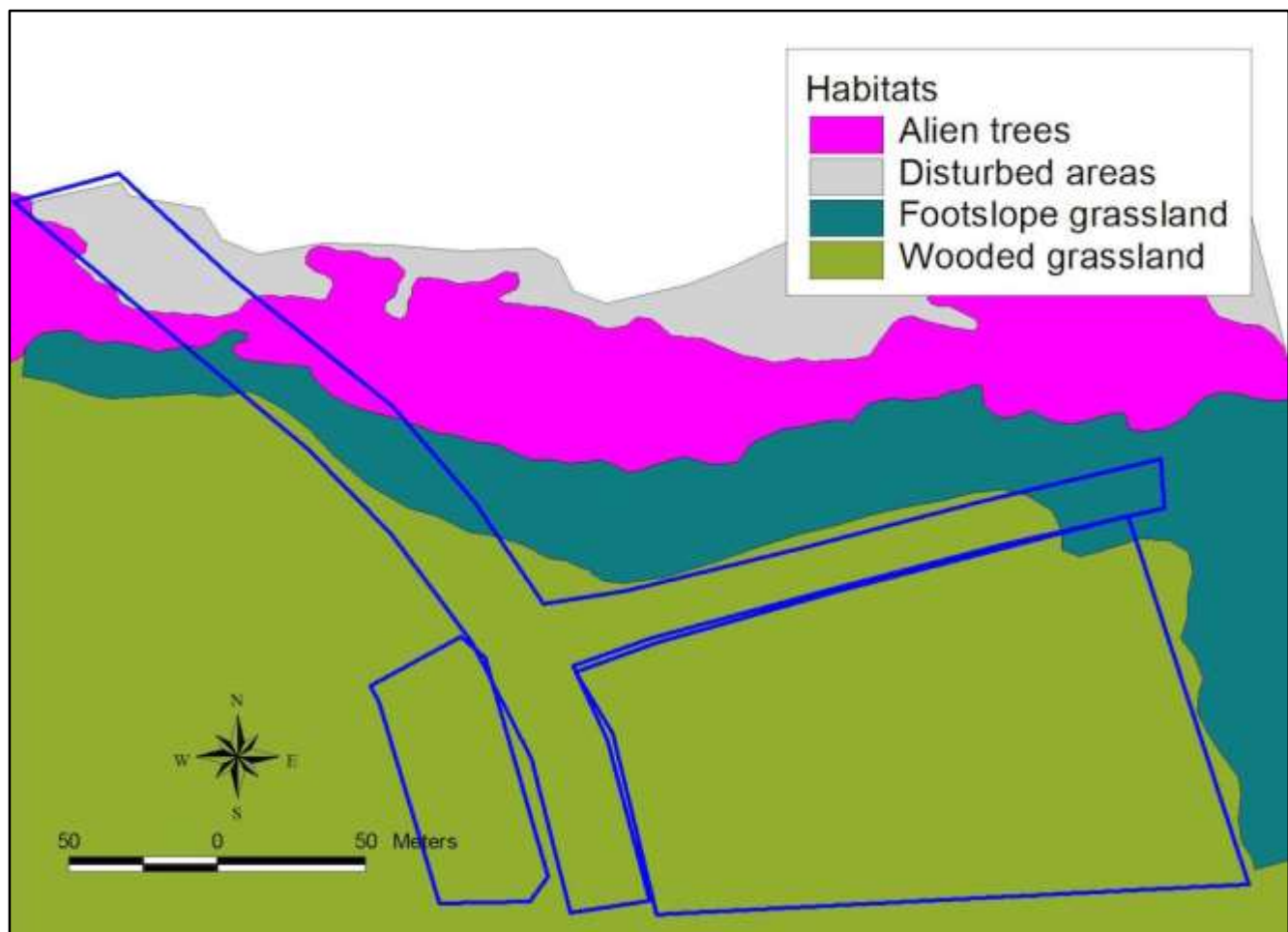


Figure 8: Habitat map of the site.

Pelargonium luridum, *Chaetacanthus costatus*, *Solanum panduriforme* and *Turbina oblongata*. Common woody species on site include *Acacia natalitia*, *Ziziphus mucronata*, *Rhus pyroides*, *Rhus lucida*, *Acacia nilotica*, *Rhoicissus tridentata*, *Cussonia paniculata* and *Acacia sieberiana* var. *woodii*. The bottom-slope areas are dominated by the tall thatching grass, *Hyparrhenia tamba*.

A detailed habitat map of the site is shown in Figure 8.

Flora of the site

All plant species found during the survey in remaining natural areas are listed in Appendix 2. Due to the fact that the fieldwork component of this survey lacked seasonal coverage, the species list provided is unlikely to be comprehensive, but nevertheless provides a good indication of the species diversity and composition of the study area and also provides adequate information for determining the natural status of habitats on site. In the species list (Appendix 2) all exotic species are indicated by an asterisk.

A total of 146 species were recorded on the site during the field survey, 17 of which are exotic and an additional 15 of which are declared weeds or invader plants. The proportion of naturalized exotic and invader species is moderate (22%). Of the indigenous species on site, 6 are obligate wetland species.

The species list compiled for the site closely matches the expected species composition for KwaZulu-Natal Highland Thornveld, but with a number of species also indicated for Thukela Thornveld. The site therefore has a species composition that suggests that it is in a transition between the two vegetation types.

The declared weeds or alien invader species, according to the Conservation of Agricultural Resources Act (Act No.43 of 1983) are *Agave americana** (Proposed declared invaders), *Acacia mearnsii**, *Cortaderia selloana**, *Ipomoea purpurea**, *Opuntia ficus-indica**, *Solanum mauritianum** and *Zinnia peruviana** (Declared weeds), *Eucalyptus camaldulensis**, *Ligustrum lucidum**, *Melia azeradach**, *Morus alba**, *Populus x canescens**, *Pyracantha angustifolia**, *Robinia pseudoacacia** and *Rorippa nasturtium-aquaticum*.

Disturbance on site

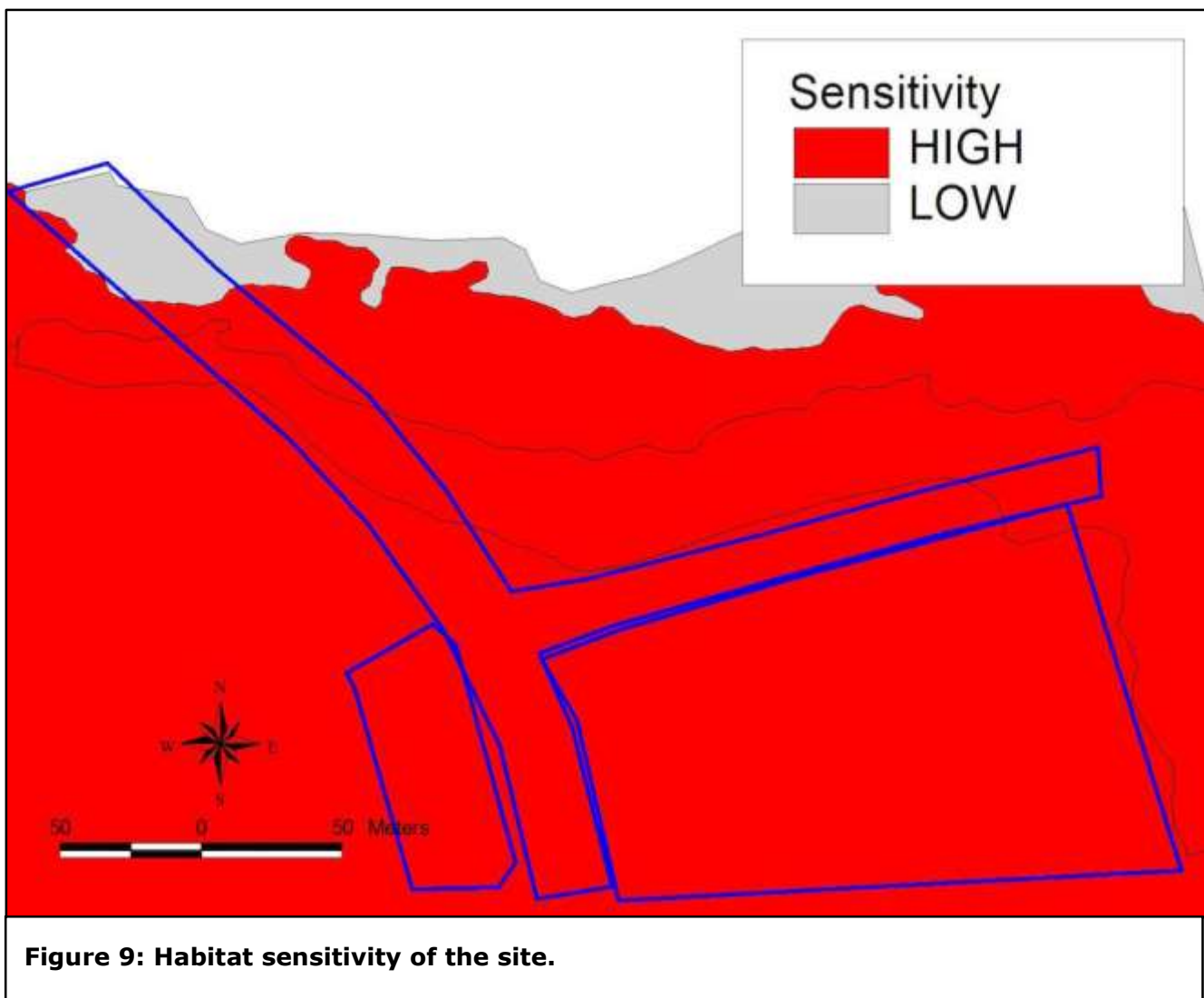
At first glance, the vegetation on site appears to be natural, but there are indications that it has been disturbed in the distant past. Based on the species composition, including the presence of a variety of geophytes and resprouting herbaceous plants, it was probably not ploughed. Stone outcrops on site also appear to be natural, which further indicates that the soil was probably not disturbed at any stage. The site was, however, burnt in the recent past and, based on the presence of burnt logs in places, probably gets burnt regularly. There is some agriculture to the south of the site and the vehicle tracks passing the site go to a shooting range nearby. Formal suburbs are found directly across the stream. Directly east of the site are building activities and existing buildings. The site is therefore probably influenced by human activities, but this has not affected the species composition of the vegetation to a significant degree. The stream is heavily invaded by alien plants, but these have not invaded the site itself to any significant degree.

Wet areas on site

The stream is the main wetland feature on site. There are places on site where there is tall grassland that would usually be associated with deeper soils on bottom slopes, but this does not qualify as being a wetland plant community. No seeps or drainage areas were found on site.

Sensitivity assessment

There are features on site that need to be taken into account in order to evaluate sensitivity of the site and its surroundings. These include the following:



1. Areas important for meeting conservation objectives: According to KwaZulu-Natal Systematic Conservation Plan (KZNSCP), the entire site falls within a CBA1 area, meaning that it is of critical importance in preserving biodiversity patterns in the province. This means that all natural vegetation on site must be denoted as having HIGH sensitivity, irrespective of its condition.
2. Riparian areas: According to the National Water Act, riparian areas are classified as a water resource and are therefore considered to be sensitive. The riparian areas on site are completely invaded by alien plants, but are denoted as sensitive on the basis that they are wetlands.



Discussion

The requirements of this study were to undertake a specialist study to describe the vegetation and flora of the site. The vegetation study identified wooded grassland across most of the site, which is adjacent to a stream invaded by alien trees. The wooded grassland has a relatively high diversity of plant species and is in moderately good condition.

The site is within one regional vegetation type, a grassland vegetation type called KwaZulu-Natal Highland Thornveld. There is a second vegetation type nearby called Thukela Thornveld and the site has species that suggest that it is in a transition zone between these two vegetation types. The species composition of the vegetation on site supports the observation that this is a transition zone. The vegetation types are both classified as Least Threatened, and neither is listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).

According to the KwaZulu-Natal Systematic Conservation Plan (KZNSCP), all of the vegetation on site falls within a CBA1 area and is therefore considered according to the KZNSCP to be of critical importance in meeting regional conservation objectives. On this basis, the entire site has been designated as having HIGH sensitivity. The accuracy of this conservation assessment is questioned, however, on the basis that the entire urban area of Estcourt, including all transformed, disturbed and degraded areas associated with the town, also fall within the CBA1 area.

The advantage of developing the current site and not one in another location is that it is immediately adjacent to the existing town. There will therefore not be fragmentation of terrestrial habitats associated with loss of the habitat on site. The stream will be crossed, but if this is done in a way that limits downstream hydrological effects, it will have little effect on downstream areas. The habitat at the proposed crossing site is currently highly degraded due to alien invasion.

In addition to the apparently high regional conservation value attributed to the site in the KZNSCP, there are populations of three species of plant on site that are listed as Declining, including a large population of *Hypoxis hemerocallidea* and a small population of each of *Crinum bulbispermum* and *Pterocelastrus rostratus*. These three species are in the lowest possible threatened category and are also threatened by medicinal harvesting rather than loss of habitat. A plant rescue operation would therefore be adequate for mitigating against loss of the individuals found on site. There are three other listed plant species that have habitat requirements that are partially met by those found on site, but none of these species were found during the field survey. Surveys during the flowering times of these species are recommended to confirm whether they occur on site or not. This is a precautionary measure to ensure that no additional species of concern are affected by the proposed project.

Recommendations

Based on the botanical assessment, this section of the report provides recommendations for the project. The following recommendations are made:

- The exact boundaries of the possible wetlands on site should be determined using formal wetland delineation.
- According to the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared aliens that occur on the property must be effectively controlled. In terms of this Act 198 alien species were listed as declared weeds and invaders and ascribed to one of the following categories:
 - **Category 1:** Prohibited and must be controlled.
 - **Category 2** (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
 - **Category 3** (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

The declared aliens that occur on site are listed in Appendix 2.

- In terms of the National Environmental Management: Biodiversity Act, invasive species are either prohibited or require a permit to be retained on site. It is recommended that these species are controlled using registered control methods.
- There is a population of Aloes in the north-eastern corner of the site that could not be identified to species level. A June 2016 survey is required to co-incide with the likely flowering time of possible species to determine whether this is *Aloe greatheadii*, (not threatened, most likely identity) *Aloe maculata* (not threatened) or *Aloe prinslooii* (Near Threatened).
- A winter follow-up survey (can also be June 2016) is recommended to confirm that the Endangered plant species, *Aloe inconspicua*, does not occur on site. The species was not found during the current survey, but as its name suggests, the species is inconspicuous and may only be detected during budding or flowering. If the species is found on site then a permit would be required for removal of any individuals.
- A follow-up survey to confirm the identity of the tree, *Pterocelastrus rostratus*, is required. This can be in June 2016 when the small coppicing plants have reached sufficient stature to be properly

identified. The plant material currently on site was too stunted from a recent fire to confirm the identity of this species and it is possible that it may be a non-listed species of *Pterocelastrus*.

- Permits will be required for protected species found on site, including *Hypoxis hemerocallidea*, *Aloe* species and *Crinum bulbispermum*.
- A formal Plant Rescue Plan should be compiled to indicate the process to be followed to rescue any plant species on site that require rescue. This includes all geophyte bulbs and herbaceous succulents, as well as any other species that the authorities require to be rescued. It should include details on steps to follow if additional species are located that were not previously recorded during field surveys of the site.

Conclusion

The following conclusions can be made with regards to the proposed development of the site:

- The site consists intact natural habitat that has moderately high species richness and the presence of various lower-ranked species of concern. It is also within an area designated as a CBA1 area in the provincial conservation plan, which means that it is considered to have high regional conservation significance. There are therefore potentially significant impacts related to developing the site.
- The site is directly adjacent to the existing urban area and adjacent to a degraded stream. The site is associated within the zone of degradation commonly associated with human settlement. There will therefore be little fragmentation associated with developing the site.
- The entire urban area of Estcourt is also within the CBA1 area, which brings into question the perceived importance of the CBA1 mapping, since it does not distinguish between transformed areas and natural habitats and therefore reduces the value of the conservation plan for development planning.
- Recommendations provided above ensure that no species of concern are negatively affected in an unaccounted manner. If all recommendations are adhered to then it is not expected that there will be any unacceptable impacts on the floristic receiving environment.

References

- BROMILOW, C. 2010. Problem plants and alien weeds of South Africa. Briza, Pretoria.
- CAMPBELL, PETA. date unknown. *Rehabilitation recommendations after alien plant control and Wattle Control*. ARC-PPRI publication.
- DENT, M.C., LYNCH, S.D. & SCHULZE, R.E. 1989. Mapping mean annual and other rainfall statistics in southern Africa. Department of Agricultural Engineering, University of Natal. ACRU Report No. 27. Massachusetts: Clark University.
- DRIVER, A., MAZE, K., ROUGET, M., LOMBARD, A.T., NEL, J., TURPIE, J.K., COWLING, R.M., DESMET, P., GOODMAN, P., HARRIS, J., JONAS, Z., REYERS, B., SINK, K and STRAUSS, T. 2005. National Spatial Biodiversity Assessment 2004: priorities for biodiversity conservation in South Africa. *Strelitzia* 17. South African National Biodiversity Institute, Pretoria.
- FAIRBANKS, D.H.K., THOMPSON, M.W., VINK, D.E., NEWBY, T.S., VAN DEN BERG, H.M & EVERARD, D.A. 2000. The South African Land-Cover Characteristics Database: a synopsis of the landscape. *S.Afr.J.Science* 96: 69-82.
- GERMISHUIZEN, G., MEYER, N.L., STEENKAMP, Y and KEITH, M. (eds.) (2006). A checklist of South African plants. Southern African Botanical Diversity Network Report No. 41, SABONET, Pretoria.
- HENDERSON, L. 2001. Alien weeds and invasive plants. Agricultural Research Council.
- HOARE, D.B., PFAB, M. & MILLS, L. (in prep.). A floristic classification of the grassland vegetation of Gauteng.
- IUCN (2000). IUCN Red List Categories. Prepared by the IUCN Species Survival Commission. Gland, Switzerland.
- IUCN (2001). IUCN Red Data List categories and criteria: Version 3.1. IUCN Species Survival Commission: Gland, Switzerland.
- MACVICAR, C. N., SCOTNEY, D. M. SKINNER, T. E. NIEHAUS, H. S. & LOUBSER, J. H., 1974. A classification of land (climate, terrain form, soil) primarily for rainfed agriculture. *S. Afr. J. Agric. Extension*, 3(3): 1-4.
- MUCINA, L, BREDEKAMP, G.J., HOARE, D.B & MCDONALD, D.J. 2000. A National Vegetation Database for South Africa *South African Journal of Science* 96: 1–2.
- MUCINA, L. AND RUTHERFORD, M.C. (editors) 2006. *Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide*. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.
- MUCINA, L., RUTHERFORD, M.C. AND POWRIE, I.W. (editors) 2005. *Vegetation map of South Africa, Lesotho and Swaziland, 1:1 000 000 SCALE SHEET MAPS* South African National Biodiversity Institute, Pretoria.
- MUCINA, L., RUTHERFORD, M.C., HOARE, D.B. & POWRIE, L.W. 2003. *VegMap: The new vegetation map of South Africa, Lesotho and Swaziland*. In: Pedrotti, F. (ed.) *Abstracts: Water Resources and Vegetation, 46th Symposium of the International Association for Vegetation Science, June 8 to 14 – Napoli, Italy*.

MUELLER-DOMBOIS, D. AND ELLENBERG, H. 1974, Aims and Methods of Vegetation Ecology, John Wiley and Sons, New York.

RUTHERFORD, M.C. & WESTFALL, R.H. (1994). Biomes of southern Africa: an objective categorization. *Memoirs of the Botanical Survey of South Africa* No. 63.

Appendix 1: Red / Orange List plant species recorded within the quarter degree within which the study area is situated, namely 2929BB.

Sources: South African National Biodiversity Institute in Pretoria.

Family	Taxon	Status	Habitat	Likelihood of occurrence in study area
ACANTHACEAE	<i>Barleria argillicola</i>	Critically Endangered	Between Weenen and Estcourt. Savanna, in eroded doleritic soils or among dolerite boulders, 900-1200m.	LOW , not known from site, habitat marginal.
ACANTHACEAE	<i>Barleria greenii</i>	Critically Endangered	Between Weenen and Estcourt. Savanna, on moderately sloping, north-facing aspects in open, rocky areas with heavy, dense, black clay soils strewn with doleritic rock. It occurs at the interface of grassland and valley bushveld, mostly in, or along the borders of seasonal or perennial streams, drainage lines or boggy areas, 1200-1260 m.	LOW , not known from site, habitat marginal.
AMARYLLIDACEAE	<i>Crinum bulbispermum</i>	Declining	Grows along stream banks and in swampy grasslands that usually dry out during the winter months when these plants are dormant	MEDIUM , habitat potentially available at bottom of site
AMARYLLIDACEAE	<i>Crinum macowanii</i>	Declining	Eastern Cape to Limpopo Province and from Zimbabwe to Eritrea. Mountain grassland and stony slopes in hard dry shale, gravelly soil or sandy flats.	DEFINITE , suitable habitat occurs on site, 20 individuals found
APOCYNACEAE	<i>Asclepias oereophila</i>	Rare	Eastern Cape and KwaZulu-Natal, from Kamberg to Ramatsiliso's Gate. Montane grassland, 1800-2200m.	LOW , only occurs at higher altitudes
APOCYNACEAE	<i>Orbea woodii</i>	Vulnerable	Tugela River valley. Valley thicket and savanna, open and closed dry woodland, on gently sloping areas of shale with dolerite rocks, between stones and small tufts of grass in open places, 800-1200m.	MEDIUM , habitat marginal
AQUIFOLIACEAE	<i>Ilex mitis</i> var. <i>mitis</i>	Declining	Widespread from Table Mountain in the Western Cape to Ethiopia and	MEDIUM , habitat potentially available

			also Madagascar. Along rivers and streams in forest and thickets, sometimes in the open. Found from sea level to inland mountain slopes.	on site within the riparian zone, but habitat highly degraded
ASPHODELACEAE	<i>Aloe cooperi</i> subsp. <i>cooperi</i>	Declining (currently listed as LC)	Occupies a wide variety of habitats in grasslands, from marshy areas to dry and well-drained, often wedges in shallow pockets among rocks, but also on hillsides in open grasslands.	HIGH , suitable habitat on site.
ASPHODELACEAE	<i>Aloe dominella</i>	Near threatened	Western KwaZulu-Natal from Mooi River to Bergville and north-eastwards to Vryheid. In grassland or thornveld, in hilly or gently undulating areas, often in rocky outcrops but can also occur in open grasslands and along road reserves.	HIGH , suitable habitat on site.
ASPHODELACEAE	<i>Aloe inconspicua</i>	Endangered	Bushman's River Valley near Estcourt. Transition between grassland and valley bushveld, mostly in short grassland, generally on gently sloping ground beside large hills and in hilly thornveld. Only known from 4 sub-populations, none of which are known from this site.	HIGH , suitable habitat on site.
ASPHODOLACEAE	<i>Aloe prinslooii</i>	Near threatened	Tugela River Basin between Ladismith and Muden. Savanna, in dry, tall grassland and open woodland, and transition communities between savanna woodland and valley bushveld thicket, 800-1400m.	MEDIUM , suitable habitat on site, but distribution .
ASTERACEAE	<i>Helichrysum drakensbergensis</i>	Rare	Bergville and Underberg. A rare Drakensberg endemic known from 4 sites in alpine grassland from 1525-2740m.	LOW , no suitable habitat, outside range.
CELASTRACEAE	<i>Elaeodendron croceum</i>	Declining	From Knysna through the Eastern Cape and KwaZulu-Natal and northwards along the Mpumalanga and Limpopo Drakensberg Escarpment. Also in Zimbabwe. Margins of coastal and montane forests.	LOW , no suitable habitat
CELASTRACEAE	<i>Elaeodendron transvaalense</i>	Near Threatened	Widespread in Southern Africa, including Angola, Namibia, Botswana, Zambia, Zimbabwe, Swaziland and Mozambique. In South Africa it is restricted to eastern, summer rainfall areas from the KwaZulu-Natal coast northwards through eastern Mpumalanga into Limpopo and North West provinces. Savanna or bushveld,	LOW , habitat marginally suitable, edge of known distribution

			from open woodland to thickets, often on termite mounds.	
CELASTRACEAE	<i>Pterocelastrus rostratus</i>	Declining	Forest and montane scrub in forest margins and on mountain sides.	HIGH , habitat potentially available on site
COLCHICACEAE	<i>Sandersonia aurantiaca</i>	Declining	Northern KwaZulu-Natal to East London, also in Swaziland. Cool moist slopes with minimal herbivory and fire, 200 - 1800m.	MEDIUM , site conditions not ideal, burnt recently, but within geographical and environmental range.
CORNACEAE	<i>Curtisia dentata</i>	Near threatened	Cape Peninsula to the Zimbabwe-Mozambique highlands. Evergreen forest from coast to 1800 m.	LOW , no suitable habitat in study area
CYPERACEAE	<i>Carex subinflata</i>	Vulnerable	Drakensberg Mountain Range in KwaZulu-Natal, Lesotho and Eastern Cape. Bogs, seeps or along rivers at high altitudes, usually in full sun.	LOW , habitat on site not suitable.
FABACEAE	<i>Calpurnia woodii</i>	Vulnerable	Bushman's River valley near Estcourt. Grassland and grassland-woodland transitions on steep, dry, southeast-facing slopes with loose shale soils, 1500m. A range-restricted species known from only two locations.	LOW , site is outside river valley, not SE or steep, not known from site.
GUNNERACEAE	<i>Gunnera perpensa</i>	Declining	Western Cape to Ethiopia. Damp marshy area and vleis from coast to 2400 m. It is an obligate wetland plant that grows in shallow water around the edge of pools in marshy areas and along streams. It is not frost tolerant and, even in warm areas it will die back during the coldest months.	MEDIUM , suitable habitat in study area, but habitat is severely degraded
HYACINTHACEAE	<i>Bowiea volubilis</i> <i>subsp. volubilis</i>	Vulnerable	Low and medium altitudes, usually along mountain ranges and in thickly vegetated river valleys, often under bush clumps and in boulder scree, sometimes found scrambling at the margins of karroid, succulent bush in the Eastern Cape. Occurs in bushy kloofs at the coast and inland in KwaZulu-Natal. In Gauteng, Mpumalanga and North West Province it is often found in open woodland or on steep rocky hills usually in well-shaded situations. Tolerates wet and dry conditions, growing predominantly in summer rainfall areas with an annual rainfall of 200-800 mm. Harvesting for traditional medicine is a severe threat	HIGH , suitable habitat in study area, not found on site

HYACINTHACEAE	<i>Merwillia plumbea</i>	Near threatened	Widespread in eastern half of South Africa. Also in Swaziland and Lesotho. Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m.	LOW , no suitable habitat in study area
HYPOXIDACEAE	<i>Hypoxis hemerocallidea</i>	Declining	Widespread in the eastern part of southern Africa from the Eastern Cape to Botswana and Mozambique. Occurs in a wide range of habitats, including sandy hills on the margins of dune forests, open, rocky grassland, dry, stony, grassy slopes, mountain slopes and plateaus. Appears to be drought and fire tolerant.	DEFINITE , large numbers found on site.
MYRSINACEAE	<i>Rapanea melanophloeos</i>	Declining	Cape Peninsula to Malawi. Coastal, swamp and mountain forest, on forest margins and bush clumps, often in damp areas from coast to mountains.	MEDIUM , habitat potentially available on site
ORCHIDACEAE	<i>Disa scullyi</i>	Endangered	KwaZulu-Natal Midlands around Estcourt southwards along the KwaZulu-Natal and Eastern Cape Drakensberg foothills to the Amathole Mountains near Hogsback. Wetlands, seepages or stream edges in high altitude grassland, 1 500-2 000 m.	LOW , no suitable habitat available on site, below altitude range
SAPOTACEAE	<i>Vitellariopsis dispar</i>	Rare	Tugela River Basin. Closed woodland and dry riverine forest, 800-1200m.	LOW , no suitable habitat available on site

* Conservation Status Category assessment according to IUCN Ver. 3.1 (IUCN, 2001), as evaluated by the Threatened Species Programme of the South African National Biodiversity Institute in Pretoria (<http://redlist.sanbi.org/>). Categories: VU = Vulnerable, EN = Endangered, CR = Critically Endangered, NT = Near Threatened.

* Probability of occurrence, as follows: **LOW** – no suitable habitats occur on site / habitats on site do not match habitat description for species, **MEDIUM** – habitats on site match general habitat description for species (e.g. grassland), but microhabitat requirements are absent (e.g. rocky grassland on shallow soils overlying dolomite), **HIGH** – habitats on site match very strongly the general and microhabitat description for the species, **DEFINITE** – species found on site.

Appendix 2: Provisional checklist of plant species found on the site

Species	Category
<i>Abildgaardia ovata</i>	
<i>Abutilon grantii</i>	
<i>Acacia caffra</i>	
<i>Acacia mearnsii</i> *	Declared weed / Category 2
<i>Acacia natalitia</i>	
<i>Acacia nilotica</i>	
<i>Acacia sieberiana</i> var. <i>woodii</i>	
<i>Agave americana</i> *	Proposed declared weed
<i>Aloe marlothii</i>	
<i>Aloe</i> species cf. <i>greatheadii</i>	
<i>Aristida congesta</i> subsp. <i>barbicollis</i>	
<i>Aristida congesta</i> subsp. <i>congesta</i>	
<i>Asparagus aethiopicus</i>	
<i>Asparagus</i> species	
<i>Aster bakerianus</i>	
<i>Berkheya macrocephala</i>	
<i>Berkheya setifera</i>	
<i>Bidens pilosa</i> *	
<i>Blepharis subvolubilis</i>	
<i>Brachiaria serrata</i>	
<i>Bromus catharticus</i> *	
<i>Bulbostylis burchellii</i>	
<i>Callistemon rigidus</i> *	
<i>Canthium gilfillanii</i>	
<i>Carex</i> species	
<i>Chaetacanthus costatus</i>	
<i>Chamaecrista comosa</i>	
<i>Chlorophytum fasciculatum</i>	
<i>Cissus</i> species	
<i>Commelina africana</i>	
<i>Conyza podocephala</i>	
<i>Conyza scabrida</i>	
<i>Corchorus asplenifolius</i>	
<i>Cortaderia selloana</i> *	Declared weed / Category 1b
<i>Crabbea acaulis</i>	
<i>Crinum bulbispermum</i>	Declining
<i>Cussonia paniculata</i>	
<i>Cymbopogon excavatus</i>	
<i>Cymbopogon pospischilli</i>	
<i>Cyperus obtusiflorus</i> var. <i>flavissimus</i>	
<i>Cyperus</i> species#	
<i>Cyphostemma cirrhosis</i>	

<i>Digitaria diagonalis</i>	
<i>Diospyros lycioides</i>	
<i>Elionurus muticus</i>	
<i>Eragrostis capensis</i>	
<i>Eragrostis curvula</i>	
<i>Eragrostis racemosa</i>	
<i>Eucalyptus camaldulensis</i>	Declared invader category 2
<i>Felicia muricata</i>	
<i>Gerbera ambigua</i>	
<i>Gerbera piloselloides</i>	
<i>Gymnosporia buxifolia</i>	
<i>Helichrysum nudifolium</i>	
<i>Helichrysum rugulosum</i>	
<i>Hemizygia pretoriae</i>	
<i>Hermannia depressa</i>	
<i>Heteropogon contortus</i>	
<i>Hibiscus aethiopicus</i>	
<i>Hibiscus microcarpus</i>	
<i>Hibiscus trionum</i>	
<i>Hyparrhenia tamba</i>	
<i>Hypoxis argenteus</i>	
<i>Hypoxis hemerocallidea</i>	Declining
<i>Hypoxis rigidula</i>	
<i>Hypoxis obtusa</i>	
<i>Indigofera cf. eriocarpa</i>	
<i>Indigofera species</i>	
<i>Ipomoea purpurea*</i>	Declared weed / Category 1b
cf <i>Jasminum humile</i>	
<i>Kohautia amatymbica</i>	
<i>Lantana rugosa</i>	
<i>Ledebouria ovatifolia</i>	
<i>Ledebouria revoluta</i>	
<i>Ligustrum lucidum*</i>	Declared invader category 3
<i>Melia azeradach*</i>	Declared invader category 3
<i>Melinis nerviglumis</i>	
<i>Melinis repens</i>	
<i>Monsonia angustifolia</i>	
<i>Morus alba*</i>	Declared invader category 3
<i>Oenothera rosea*</i>	
<i>Oenothera tetraptera*</i>	
<i>Opuntia ficus-indica*</i>	Declared weed
<i>Oxalis corniculata*</i>	
<i>Oxalis obliquifolia</i>	
<i>Panicum maximum</i>	
<i>Paspalum distichum*#</i>	
<i>Paspalum urvillei*#</i>	
<i>Pelargonium cf. alchemilloides</i>	
<i>Pelargonium luridum</i>	
<i>Pennisetum sphacelatum</i>	

<i>Pentanisia angustifolia</i>	
<i>Phyllanthus parvulus</i>	
<i>Physalis viscosa</i>	
<i>Plantago major*</i>	
<i>Pollichia campestris</i>	
<i>Polygala species</i>	
<i>Populus x canescens</i>	Declared invader category 2
<i>Pseudognaphalium oligandrum*</i>	
<i>Pyracantha angustifolia</i>	Declared invader category 3
<i>Ranunculus multifidus#</i>	
<i>Rhoicissus tridentata</i>	
<i>Rhynchosia adenodes</i>	
<i>Rhynchosia monophylla</i>	
<i>Robinia pseudoacacia*</i>	Declared invader category 2
<i>Rorippa nasturtium-aquaticum*</i>	Declared invader category 2
<i>Rumex crispus*</i>	
<i>Salvia runcinata</i>	
<i>Scabiosa columbaria</i>	
<i>Schkuhria pinnata*</i>	
<i>Scirpoides burkei#</i>	
<i>Searsia lucida</i>	
<i>Searsia pyroides</i>	
<i>Searsia species</i>	
<i>Senecio cf. retrorsus</i>	
<i>Senecio erubescens subsp. crepidifolia</i>	
<i>Senecio pentactinus</i>	
<i>Senna septemtrionalis*</i>	
<i>Setaria nigrirostris</i>	
<i>Setaria sphacelata var. torta</i>	
<i>Sida cordifolia</i>	
<i>Solanum mauritianum*</i>	Declared weed / Category 1b
<i>Solanum nigrum*</i>	
<i>Solanum panduriforme</i>	
<i>Sonchus oleracus*</i>	
<i>Sporobolus cf. fimbriatus</i>	
<i>Striga elegans</i>	
<i>Tagetes minuta*</i>	
<i>Tephrosia capensis</i>	
<i>Tephrosia species</i>	
<i>Teucrium trifidum</i>	
<i>Themeda triandra</i>	
<i>Thesium natalense</i>	
<i>Tragus koelerioides</i>	
<i>Trifolium repens*</i>	
<i>Tristachya leucothrix</i>	
<i>Turbina oblongata</i>	
<i>Typha capensis#</i>	
<i>Verbena bonariensis*</i>	
<i>Vernonia capensis</i>	

Vernonia cf. fastigiata	
Vernonia oligocephala	
Xysmalobium species	
Zinnia peruviana*	Declared weed
Ziziphus mucronata	
Zornia milneana	

Appendix 3: Plant species previously recorded in the grid in which the site is located.

Asystasia schimperi T.Anderson
Barleria argillicola Oberm.
Blepharis longispica C.B.Clarke
Chaetacanthus burchellii Nees
Dicliptera clinopodia Nees
Hypoestes forskaolii (Vahl) R.Br.
Hypoestes triflora (Forssk.) Roem. & Schult.
Isoglossa grantii C.B.Clarke
Agapanthus campanulatus F.M.Leight. subsp. campanulatus
Agapanthus campanulatus F.M.Leight. subsp. patens (F.M.Leight.) F.M.Leight.
Tulbaghia leucantha Baker
Tulbaghia ludwigiana Harv.
Tulbaghia natalensis Baker
Achyroopsis leptostachya (E.Mey. ex Meisn.) Baker & C.B.Clarke
Alternanthera pungens Kunth
Gomphrena celosioides Mart.
Crinum bulbispermum (Burm.f.) Milne-Redh. & Schweick.
Crinum macowanii Baker
Cyrtanthus breviflorus Harv.
Cyrtanthus contractus N.E.Br.
Haemanthus carneus Ker Gawl.
Haemanthus humilis Jacq. subsp. hirsutus (Baker) Snijman
Nerine appendiculata Baker
Scadoxus puniceus (L.) Friis & Nordal
Ozoroa paniculosa (Sond.) R.& A.Fern. var. paniculosa
Searsia dentata (Thunb.) F.A.Barkley
Searsia discolor (E.Mey. ex Sond.) Moffett
Searsia gerrardii (Harv. ex Engl.) Moffett
Searsia lucida (L.) F.A.Barkley forma lucida
Searsia pyroides (Burch.) Moffett var. gracilis (Engl.) Moffett
Searsia rehmanniana (Engl.) Moffett var. rehmanniana
Chlorophytum cooperi (Baker) Nordal
Alepidea acutidens Weim. var. acutidens
Alepidea acutidens Weim. var. dispar Weim.
Alepidea peduncularis A.Rich.
Alepidea pilifera Weim.
Alepidea setifera N.E.Br.
Centella asiatica (L.) Urb.
Cyclosporum leptophyllum (Pers.) Sprague ex Britton & P.Wilson
Daucus carota L.

Heteromorpha arborescens (Spreng.) Cham. & Schltl. var. abyssinica (Hochst. ex A.Rich.) H.Wolff
Acokanthera oppositifolia (Lam.) Codd
Araujia sericifera Brot.
Asclepias gibba (E.Mey.) Schltr. var. media N.E.Br.
Asclepias macropus (Schltr.) Schltr.
Asclepias meyeriana (Schltr.) Schltr.
Asclepias multicaulis (E.Mey.) Schltr.
Asclepias oreophila Nicholas
Asclepias stellifera Schltr.
Aspidoglossum woodii (Schltr.) Kupicha
Aspidonepsis diploglossa (Turcz.) Nicholas & Goyder
Aspidonepsis reenensis (N.E.Br.) Nicholas & Goyder
Brachystelma pygmaeum (Schltr.) N.E.Br. subsp. pygmaeum
Ceropegia carnosa E.Mey.
Duvalia polita N.E.Br.
Fanninia caloglossa Harv.
Miraglossum pulchellum (Schltr.) Kupicha
Orbea woodii (N.E.Br.) L.C.Leach
Raphionacme hirsuta (E.Mey.) R.A.Dyer
Riocreuxia torulosa (E.Mey.) Decne. var. torulosa
Schizoglossum atropurpureum E.Mey. subsp. atropurpureum
Schizoglossum elingue N.E.Br. subsp. elingue
Schizoglossum hilliardiae Kupicha
Schizoglossum nitidum Schltr.
Schizoglossum stenoglossum Schltr. subsp. flavum (N.E.Br.) Kupicha
Sisyranthus huttoniae (S.Moore) S.Moore
Xysmalobium parviflorum Harv. ex Scott-Elliot
Xysmalobium undulatum (L.) Aiton f. var. undulatum
Aponogeton junceus Lehm.
Zantedeschia albomaculata (Hook.) Baill. subsp. albomaculata
Cussonia paniculata Eckl. & Zeyh. subsp. sinuata (Reyneke & Kok) De Winter
Gongylanthus renifolius (Mitt.) Steph.
Asparagus densiflorus (Kunth) Jessop
Asparagus devenishii (Oberm.) Fellingham & N.L.Mey.
Asparagus minutiflorus (Kunth) Baker
Asparagus ramosissimus Baker
Asparagus virgatus Baker
Aloe arborescens Mill.
Aloe cooperi Baker subsp. cooperi
Aloe dominella Reynolds
Aloe ecklonis Salm-Dyck
Aloe inconspicua Plowes
Aloe maculata All.
Aloe marlothii A.Berger subsp. marlothii
Aloe minima Baker
Aloe mudenensis Reynolds

Aloe prinslooii I. Verd. & D.S. Hardy
Bulbine abyssinica A. Rich.
Bulbine capitata Poelln.
Kniphofia angustifolia (Baker) Codd
Kniphofia brachystachya (Zahlbr.) Codd
Kniphofia ichopensis Schinz var. ichopensis
Kniphofia laxiflora Kunth
Kniphofia northiae Baker
Kniphofia thodei Baker
Trachyandra asperata Kunth var. nataglencoensis (Kuntze) Oberm.
Trachyandra asperata Kunth var. stenophylla (Baker) Oberm.
Trachyandra gerrardii (Baker) Oberm.
Asplenium splendens Kunze subsp. splendens
Asplenium stoloniferum Bory
Ambrosia artemisiifolia L.
Aster squamatus (Spreng.) Hieron.
Athrixia angustissima DC.
Athrixia fontana MacOwan
Athrixia phylloides DC.
Berkheya onopordifolia (DC.) O. Hoffm. ex Burt Davy var. glabra Bohnen ex Roessler
Berkheya rigida (Thunb.) Erwart, Jean White & B. Rees
Bidens bipinnata L.
Callilepis laureola DC.
Chrysanthemoides monilifera (L.) Norl. subsp. canescens (DC.) Norl.
Cineraria lyratiformis Cron
Conyza bonariensis (L.) Cronquist
Conyza obscura DC.
Conyza pinnata (L.f.) Kuntze
Conyza scabrida DC.
Cotula hispida (DC.) Harv.
Delairea odorata Lem.
Denekia capensis Thunb.
Dicoma anomala Sond. subsp. anomala
Dicoma macrocephala DC.
Dimorphotheca caulescens Harv.
Euryops transvaalensis Klatt subsp. setilobus (N.E.Br.) B. Nord.
Felicia muricata (Thunb.) Nees subsp. muricata
Gerbera ambigua (Cass.) Sch. Bip.
Gerbera piloselloides (L.) Cass.
Gnaphalium confine Harv.
Haplocarpha scaposa Harv.
Helichrysum adenocarpum DC. subsp. adenocarpum
Helichrysum appendiculatum (L.f.) Less.
Helichrysum athrixiifolium (Kuntze) Moeser
Helichrysum aureonitens Sch. Bip.
Helichrysum aureum (Houtt.) Merr. var. monocephalum (DC.) Hilliard

Helichrysum caespitium (DC.) Harv.
Helichrysum cephaloideum DC.
Helichrysum drakensbergense Killick
Helichrysum glomeratum Klatt
Helichrysum gymnocomum DC.
Helichrysum herbaceum (Andrews) Sweet
Helichrysum melanacme DC.
Helichrysum miconiifolium DC.
Helichrysum montanum DC.
Helichrysum monticola Hilliard
Helichrysum natalitium DC.
Helichrysum nudifolium (L.) Less. var. nudifolium
Helichrysum pallidum DC.
Helichrysum platypterum DC.
Helichrysum rugulosum Less.
Helichrysum simillimum DC.
Helichrysum sutherlandii Harv.
Helichrysum tenax M.D.Hend. var. tenax
Helichrysum thapsus (Kuntze) Moeser
Helichrysum umbraculigerum Less.
Hilliardiella aristata (DC.) H.Rob.
Hilliardiella hirsuta (DC.) H.Rob.
Hypochaeris radicata L.
Lactuca tysonii (E.Phillips) C.Jeffrey
Laggera crispata (Vahl) Hepper & J.R.I.Wood
Macowania glandulosa N.E.Br.
Nidorella anomala Steetz
Nidorella auriculata DC.
Nidorella linifolia DC.
Nidorella resedifolia DC. subsp. resedifolia
Osteospermum muricatum E.Mey. ex DC. subsp. muricatum
Pseudognaphalium undulatum (L.) Hilliard & B.L.Burt
Pulicaria scabra (Thunb.) Druce
Schistostephium griseum (Harv.) Hutch.
Schistostephium hippifolium (DC.) Hutch.
Senecio achilleifolius DC.
Senecio adnatus DC.
Senecio affinis DC.
Senecio brachypodus DC.
Senecio caudatus DC.
Senecio decurrens DC.
Senecio deltoideus Less.
Senecio digitalifolius DC.
Senecio glaberrimus DC.
Senecio harveianus MacOwan
Senecio isatideus DC.

Senecio latifolius DC.
Senecio madagascariensis Poir.
Senecio othonniflorus DC.
Senecio oxyriifolius DC. subsp. oxyriifolius
Senecio paniculatus P.J.Bergius
Senecio paucicalyculatus Klatt
Senecio polyodon DC. var. polyodon
Senecio polyodon DC. var. subglaber (Kuntze) Hilliard & B.L.Burt
Senecio scoparius Harv.
Senecio speciosus Willd.
Sonchus dregeanus DC.
Tarchonanthus parvicapitulatus P.P.J.Herman
Tolpis capensis (L.) Sch.Bip.
Tragopogon dubius Scop.
Vernonia flanagani (E.Phillips) Hilliard
Vernonia gerrardii Harv.
Asterella bachmannii (Steph.) S.W.Arnell
Plagiochasma eximium (Schiffn.) Steph.
Philonotis scabrifolia (Hook.f. & Wilson) Braithw.
Begonia sutherlandii Hook.f. subsp. sutherlandii
Behnia reticulata (Thunb.) Didr.
Afrotysonia africana (Bolus) Rauschert

Appendix 2: List of protected tree species (National Forests Act).

<i>Acacia erioloba</i>	<i>Acacia haematoxylon</i>
<i>Adansonia digitata</i>	<i>Afzelia quanzensis</i>
<i>Balanites</i> subsp. <i>maughamii</i>	<i>Barringtonia racemosa</i>
<i>Boscia albitrunca</i>	<i>Brachystegia spiciformis</i>
<i>Breonadia salicina</i>	<i>Bruguiera gymnhorrhiza</i>
<i>Cassipourea swaziensis</i>	<i>Catha edulis</i>
<i>Ceriops tagal</i>	<i>Cleistanthus schlechteri</i> var. <i>schlechteri</i>
<i>Colubrina nicholsonii</i>	<i>Combretum imberbe</i>
<i>Curtisia dentata</i>	<i>Elaeodendron (Cassine) transvaalensis</i>
<i>Erythrophysa transvaalensis</i>	<i>Euclea pseudebenus</i>
<i>Ficus trichopoda</i>	<i>Leucadendron argenteum</i>
<i>Lumnitzera racemosa</i> var. <i>racemosa</i>	<i>Lydenburgia abottii</i>
<i>Lydenburgia cassinoides</i>	<i>Mimusops caffra</i>
<i>Newtonia hildebrandtii</i> var. <i>hildebrandtii</i>	<i>Ocotea bullata</i>
<i>Ozoroa namaensis</i>	<i>Philenoptera violacea (Lonchocarpus capassa)</i>
<i>Pittosporum viridiflorum</i>	<i>Podocarpus elongatus</i>
<i>Podocarpus falcatus</i>	<i>Podocarpus henkelii</i>
<i>Podocarpus latifolius</i>	<i>Protea comptonii</i>
<i>Protea curvata</i>	<i>Prunus africana</i>
<i>Pterocarpus angolensis</i>	<i>Rhizophora mucronata</i>
<i>Sclerocarya birrea</i> subsp. <i>caffra</i>	<i>Securidaca longependunculata</i>
<i>Sideroxylon inerme</i> subsp. <i>inerme</i>	<i>Tephrosia pondoensis</i>
<i>Warburgia salutaris</i>	<i>Widdringtonia cedarbergensis</i>
<i>Widdringtonia schwarzii</i>	

Catha edulis, *Curtisia dentata*, *Elaeodendron transvaalense*, *Ocotea bullata*, *Pittosporum viridiflorum*, *Podocarpus falcatus*, *Podocarpus henkelii*, *Podocarpus latifolius*, *Prunus africana* have a geographical distribution that coincides with the study area.