ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED NUCLEAR POWER STATION ('NUCLEAR 1') AND ASSOCIATED INFRASTRUCTURE

Botany and Dune Ecology Impact Assessment

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DECLARATION OF INDEPENDENCE

I, A Barrie Low as duly authorised representative of Coastec, hereby confirm my independence (as well as that of Coastec) as a specialist and declare that neither I nor Coastec have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Arcus GIBB was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Environmental Impact Assessment for the proposed conventional nuclear power station ('Nuclear 1'). I further declare that I am confident in the results of the studies undertaken and conclusions drawn as a result of it – as is described in my attached report.

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NUCLEAR 1
BOTANY AND DUNE ECOLOGY

EXECUTIVE SUMMARY

Eskom intends applying for approval to erect a nuclear power station on each of three sites: Duynefontein, on the Cape West Coast, Bantamsklip on the western Agulhas Plain east of Pearly Beach, and Thyspunt, just west of Cape St. Francis in the Eastern Cape.

As a part of the Environmental Impact Assessment process, two of the specialist studies, combined in this report, were botany and dune ecology.

This study had the following key aims for each site:

- Analysis of representative soil samples;
- Mapping and description of dominant plant communities;
- Development and analysis of comprehensive plant species lists;
- Develop rarity and sensitivity indices and their implications;
- For each site, assess the impacts of a proposed nuclear power station, internal powerlines, heavy voltage yards and access roads;
- Develop mitigatory measures for potential impacts;
- Develop approaches which would minimise impacts; and
- Make proposals whereby Eskom could be part of wider conservation initiatives, including management of land for conservation, at each site.

1. Alternative sites

1.1 Duynefontein

1.1.1 Attributes

Two vegetation types (Cape Flats Dune Strandveld and Cape Flats Sand Fynbos) are found on the site, both of which are Endangered. Eleven plant communities were identified, with general correlation between soil characteristics and plant community, but with major grouping into calcareous dunes and non-calcareous sand plain fynbos. Habitat rarity is moderate for the EIA corridor. The dune and sand plain flora was shown to be distinctive of the site, yet linked with the wider West Coast flora. Of the 380 species found on the site, 34 are rare. Species rarity is highest in the sand plain fynbos, as is localised endemism, but is substantially lower on the transverse dunes and this is echoed in the low endemism there. However, both habitat and species rarity rises appreciably when the sand plain fynbos vegetation is crossed for the planned powerlines. Sensitivity is locally high due to the presence of mobile and potentially mobile dune sand, with fire proneness being high in the sand plain fynbos. Conversely, vegetation resilience is low. The transverse dune system at Duynefontein is endemic, with this system type poorly represented on the Cape West Coast.

1.1.2 Impacts

Negative impacts revolve mainly around the construction of a nuclear facility on the site and this could lead to the loss of habitat as well as much of a rare mobile transverse dune system. Construction of powerlines over the transverse dunes and the sand plain fynbos would also potentially cause local losses and fragmentation in habitat, and rare species.

Climate change is likely to lead to a rise in sea level of some 1.1 m by 2075, and this could have major impacts on the primary and transverse dunes at the coast.

Cumulative impacts would be caused by any activity fragmenting the natural systems, compromising ecosystem functioning, as well as leading to the permanent loss of rare and quality habitat. This applies in particular to the transverse dunes (NPS) and sand plain fynbos (powerlines).

1.1.3 Mitigation

It is recommended to locate the power station to the east of the transverse dunes to avoid this rare and endemic system. Realignment of the powerline route would also be required to avoid or minimise the impact on the transverse dunes and the sand plain fynbos.

Inlet and outlet pipes should be buried in previously disturbed areas in the south (just north of the present Koeberg Nuclear Power Station) and, where excavated, the surface should be rehabilitated with indigenous species.

Spoil should be dumped in areas which have been disturbed in the past, if disposal on land is required. Such areas should be rehabilitated with indigenous species once the spoil is distributed elsewhere.

Search and rescue operations should relocate any rare and/or useful plants to areas which will enjoy long-term protection. All disturbed areas should be rehabilitated with indigenous plants. The current EMP needs to be updated to include new areas and new objectives such as these, and should also include a ***monitoring programme*** that would measure the success or otherwise of rehabilitation.

1.2 Bantamsklip

1.2.1 Attributes

Nine vegetation types were found on the site. Together with their conservation status, these are: Agulhas Limestone Fynbos (Least Threatened), Agulhas Sand Fynbos (Vulnerable), Cape Lowland Freshwater Wetlands (V), Cape Seashore Vegetation (LT), Elim Ferricrete Fynbos (Endangered), Overberg Dune Strandveld (LT), Overberg Sandstone Fynbos (LT), Southern Coastal Forest (LT) and Western Coastal Shale Band Vegetation (LT). Within these, 16 plant communities were identified, and included terrestrial (dryland) as well as wetland and riverine habitats. Soil patterns closely parallel differences in plant communities, and there is a clear separation between calcareous and non-calcareous habitats. An extremely high proportion of 50 Red Data out of a total of 463 plant species was found, and this echoes the high localised endemism for the site. There is a clear separation of local floras within the site, and this is driven by the calcareous or non-calcareous nature of the substrate, and whether communities are pioneering or climax. A key factor is the moisture regime of the soil, with riverine and wetland habitats separating from the other flora. Most of this rarity is found to the north of the R43, except for the areas of coastal limestone, and to a certain extent the coastal sands. Habitat rarity is also greater north than south of the R43, again with the exception in the areas of coastal limestone. High sensitivity in terms of erosion potential occurs on mobile and semi mobile dune systems at the coast, as well as the sandy plain and the river and wetlands. Fire is also a key factor, with high proneness related to the presence of fynbos over most of the site. Correspondingly, low resilience of the area is governed very closely by the presence of inland and coastal limestones, river and wetland systems and the transverse dunes. The dune systems at Bantamsklip are well-represented elsewhere along this coastline and are thus neither rare nor endemic.

1.2.2 Impacts

Negative impacts are mainly focused around the construction of a nuclear facility, particularly if the coastal limestones were to be developed and the primary dunes impacted. A key positive impact would be the creation of a nature reserve for the non-developed portion of the site, thus improving the conservation status of certain of the vegetation types on the Agulhas coastal plain.

Cumulative impacts would be caused by any activity fragmenting the natural systems, compromising ecosystem functioning, as well as leading to the permanent loss of rare and quality habitat. This would apply in particular to the coastal limestones.

1.2.3 Mitigation

Key mitigation should be repositioning of the footprint to avoid any areas of coastal limestone, although due to high maintenance requirements of being located within a mobile transverse dune, it is recommended that this system be avoided.

Inlet and outlet pipes should be buried and, where excavated, the surface should be rehabilitated with indigenous species.

Spoil should be dumped on areas which have been disturbed in the past, should it be necessary to dispose of spoil on land. Such areas should be rehabilitated with indigenous species once the spoil is distributed elsewhere.

Search and rescue operations should relocate any rare and/or useful plants to areas which will enjoy long-term protection. All disturbed areas should be rehabilitated with indigenous plants. An EMP, which will be required for the proposed conservation area, needs to be developed to manage these areas.

1.3 Thyspunt

1.3.1 Attributes

Five major vegetation types occur on the site (conservation status in brackets): Algoa Dune Strandveld (Least Threatened), Southern Cape Dune Fynbos (LT), Tsitsikamma Sandstone Fynbos (Vulnerable), Cape Seashore Vegetation (LT) and Cape Lowland Freshwater Wetlands (V). This translates into nine major plant communities with six wetland types and a river system. Three hundred and eighty three plant species have been recorded from the site, with a very low rare species count (14 or 3.7%), compared with other coastal areas which typically exhibit rare species counts of more than 5% (pers. obs.). Analysis of on site floras shows a clear distinction between calcareous and non-calcareous habitats, and with total soil carbon playing a key role as one moves inland from the coast, through primary dunes, stable dunes and forest. Species rarity is generally low, with the exception of one or two habitats. Likewise, habitat rarity is fairly low except for the transverse dunes, coastal limestones and wetlands. Endemism is also low, with only one local endemic found there. Sensitivity is greatest on both mobile and stable dunes, with most of the site showing high tolerance to droughting. All fynbos communities would show high proneness to burning. Habitat resilience would be lowest for the mobile dunes, coastal limestones and wetlands. The headland bypass dune system at Thyspunt is endemic to the area and the biggest on the South African coastline.

1.3.2 Impacts

Negative impacts at the proposed EIA corridor for the nuclear facility would be chiefly on the mobile dunes. However, impacts on the wetlands on the coast, as well as the Langefontein wetland, would be of the greatest concern. Crossing of the transverse dunes by powerlines would also be a potential, ***although low*****,** impact. ***The two proposed*** access roads, from the east and west, would potentially impact both the transverse dunes and associated inland wetlands. ***The Western Access Road in particular could lead to the compromising of dune function and even loss of localised wetland habitat.*** The HV Yard is likely to be located in degraded sandstone fynbos and should cause minimal impact. A key positive impact would be the creation of a nature reserve for the site, in particular if a conservation area could be formed to protect the Oyster Bay-Cape St. Francis headland bypass dune. Eskom should be a key player in this process and would need to liaise with adjacent landowners. This system is presently protected only in part and is being impacted by residential development along its length.

Although long-term impacts from the proposed inlet and outlet pipes are likely to be minimal as they would be buried, these should be constructed in such a way as to minimise impacts on the coastal habitats and species.

Cumulative impacts would be caused by any activity fragmenting the natural systems, compromising ecosystem functioning, as well as leading to the permanent loss of rare and quality habitat. A key concern is the permanent fragmentation, loss of quality habitat and reduction in ecosystem functioning of the transverse dunes, as well as the coastal wetlands .

1.3.3 Mitigation

Key mitigation should be in positioning the NPS footprint so as to cause the least impact on the identified rare and sensitive systems, notably the coastal wetlands and the Langefontein wetland. A route for powerlines across the transverse dunes is supported, ***provided that mitigation is sound and that service access to the pylons is kept to a minimum.*** The Eastern Access Road should be aligned to cause a minimum of impact on the dunes and wetlands. The Western Access Road is problematic as it would cross the western end of the northern transverse dunes as well as several associated wetlands; mitigation would require keeping to the existing dirt track as closely as possible, and avoidance of mobile dunes and wetlands. A road across the northern transverse dunes, linking the NPS and HV Yard is not supported as very little mitigation can contain the resultant impacts on this endemic system. The HV Yard should cause minimum impact as long as it is constructed on severely degraded sandstone fynbos.

Inlet and outlet pipes should be buried and, where excavated, the surface must be rehabilitated with indigenous species.

Spoil should be dumped on areas which have been disturbed in the past, should it be necessary to dispose of spoil on land. Such areas should be rehabilitated with indigenous species once the spoil is distributed elsewhere.

Search and rescue operations should relocate any rare and/or useful plants to areas which will enjoy long-term protection. All disturbed areas should be rehabilitated with indigenous plants***. These mitigation measures should be incorporated into an EMP for the site.***

2. General mitigation measures

Where loss of habitat is unavoidable, search and rescue operations should remove suitable plant material for translocation into safe areas. In addition, appropriate species should be grown in an on site nursery. This would be closely linked with a rehabilitation programme to address areas previously degraded or disturbed during the construction process. Key elements of the rehabilitation plan must include removal and stockpiling of topsoil, selection of appropriate species, a two year growth period prior to planting, production of mulch from locally removed invasive acacias and ongoing maintenance of planted areas.

A crucial mitigation is for the setting of an ecologically defendable coastal setback line and coastal corridor of minimum 200 m width for Bantamsklip and Thyspunt. Due to the presence of a sensitive and endemic dune system, this distance will increase to nearly 2 km inland for Duynefontein.

Development footprints should be adjusted so that natural habitat is avoided or habitat loss is minimised. Where possible, habitats should not be fragmented as this leads to reduced viability, mainly due to decrease in size, and where shape becomes linear as opposed to round. Where fragmented, habitat connectivity should also be maintained, and this can be accomplished for example through astute rehabilitation.

3. Recommended monitoring and evaluation programme

3.1 Rehabilitation and monitoring

A comprehensive rehabilitation and monitoring programme should be drawn up for each site. Such a programme would foster the development of a nursery at each site, and should focus on the propagation of locally occurring indigenous species. All plants suitable for growing on, as well as highly threatened species, should be included. A key part of the rehabilitation programme is the removal of invasive alien acacias. These can be used for producing mulch. Success or otherwise of plantings needs to be evaluated on a three monthly basis and dead plants replaced where appropriate.

Species should be grown on at least two years prior to any construction commencing.

3.2 Coastal corridor and setback line

A coastal corridor of minimum 200 m width to protect the sensitive coastal dunes, limestones and wetlands should be formulated and maintained for each site. Sensitive dunes, notably the primary dunes and unvegetated and partially vegetated transverse dunes should be buffered by 100 m so that these systems are permitted to function in as normal a way as possible. A buffer should also be determined for the Langefontein wetland.

3.3 Conservation areas

With the exception of Duynefontein, where there is an existing nature reserve, each site should be declared a nature reserve in perpetuity with the aim of conserving all habitats and species on that particular site. In the event of decommissioning, Eskom should maintain the area as a reserve or, failing which, the land should be handed over to a responsible conservation body. In the case of Duynefontein, resourcing should continue to be provided for the Koeberg Nature Reserve, and every effort should be made to extend the conservation area to the north, in partnership with Groot Springfontein Farm. For Thyspunt, Eskom should enter into a partnership with adjacent landowners within a view to protecting the headland bypass dune system between Oyster Bay and Cape St. Francis.

Each site should have a conservation manager who would manage that site and be responsible for drawing up a management plan.

4. Conclusions

4.1 Duynefontein

Location of the planned facility in the sensitive and mobile transverse dunes is not supported unless the footprint is moved to inland of this endemic system. Crossing of the rare and sensitive sand plain fynbos is also a concern and this should be avoided by realigning the powerline routes or crossing this habitat with longer spans.

4.2 Bantamsklip

It is assumed that no development will take place north of the R43. The present location of the NPS site may impact on rare and sensitive coastal limestone fynbos and also would likely affect the functioning of the primary dunes at the coast, the transverse dune to the west, and even the small transverse system to the east. Given their common occurrence along this coastline, loss of transverse dunes is not viewed as a key issue, but development in these mobile systems would have major implications for maintenance of built structures.

The main mitigation measure is therefore for the NPS footprint to be located to the north and east of the present site, and preferably to be located totally in the less rare and sensitive coastal sand fynbos habitat. Loss of habitat would be offset through creation of a conservation area in the remainder of the site.

Given the northern part of the site's high rarity, endemicity and sensitivity, powerline routes should not cross the ***area, and should rather be routed along the R43, and over adjacent less rare*** and disturbed land.

4.3 Thyspunt

Location of a nuclear facility on the coast would lead to loss of habitat, for which there is no mitigation, other than indirectly through providing an offset elsewhere on the site or in another area.

Complicating the siting of the facility is the presence of sensitive, and extremely rare and endemic wetlands both at the coast and inland at Langefontein. These wetlands should be in no way compromised by the planned development, either in the construction or operational phases. Loss of habitat would be offset through creation of a conservation area in the remainder of the site.

Alignments of powerline and access road routes would also need to be fine-tuned so as to avoid sensitive and rare habitats. The Eastern Access Road in particular must show sensitive alignment given the importance and endemicity of the longitudinal wetlands draining towards Cape St. Francis, whilst the western alignment poses problems for the maintenance of the western extremity of the northern transverse dune system, as well as impacts on mobile parabolic dunes. Astute mitigation is required for the Western Access Road to avoid mobile dunes and wetlands. The northern access road is viewed as too difficult to mitigate and should not be constructed.

The location of the HV Yard in degraded sandstone fynbos is considered acceptable, providing the footprint is realigned to occupy previously farmed land. ***The crossing of the mobile and semi-mobile transverse dunes by the powerline will need careful consideration, with sound mitigation. In tandem with this is a service track linking the***

NPS with the HV Yard; this route should be treated with great circumspect and service access minimised.

5. Impacts that cannot be mitigated

For **Duynefontein,** construction in an endemic transverse dune system should be excluded as a possibility for a NPS if the footprint is not moved to the east of this system.

For **Bantamsklip**, provided that there is an amendment to the location and design of the footprint to avoid the sensitive coastal systems, a NPS could be constructed.

If compromising the functioning of the wetlands at **Thyspunt** cannot be avoided, then this is regarded as a fatal flaw, especially as these systems are endemic to this coast, and the Langefontein wetland is a "one-of-a-kind" system. The location of the Western Access Road ***will require strong mitigation due to the presence of mobile dunes and possible wetlands.***

In summary

All sites have potential for development provided stringent mitigation ***at Duynefontein and Thyspunt -*** as detailed in the report and summarised above - is applied. However, without ***such*** mitigation, none of the sites is deemed suitable for construction of a nuclear power station.

BOTANICAL AND DUNE ECOLOGY IMPACT ASSESSMENT FOR THE PROPOSED NUCLEAR 1, 2 and 3 SITES AT KOEBERG (DUYNEFONTEIN), BANTAMSKLIP & THYSPUNT

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Duynefontein

Bantamsklip

Thyspunt

General

ABBREVIATIONS

amsl	above mean sea level
CFDS	Cape Flats Dune Strandveld
DEA	Department of Environmental Affairs (previously the Department of Environmental Affairs and Tourism
DLS	Die Dam Land System
E or EN	Endangered (of vegetation type or plant species rarity)
EMP	Environmental Management plan/Programme
HVY	Heavy Voltage Yard
HWM	high water mark
LT	Least Threatened (of vegetation type rarity)
MDS	multi-dimensional non-parametric scaling (analysis)
MEC	Member of the Executive Council (Minister in the Provincial Government)
NT	Near Threatened (of plant species rarity)
NBSAP	National Biodiversity Strategy Action Plan
NSBA	National Spatial Biodiversity Atlas
NPS	Nuclear Power Station
RD	Red Data (plant species)
SANBI	South African National Biodiversity Institute
SPF	Sand Plain Fynbos
STEP	Subtropical Thicket Ecosystem Planning Project
TD	Transverse dune
V or VU	Vulnerable (of vegetation type or [plant species rarity)

GLOSSARY

Aeolianite	Dune rock or rock formed from dune sand, often calcareous
Calcareous	Containing calcium (e.g. of rock or sand)
Calcrete	A hardened deposit of calcium carbonate, often formed as a layer at the soil surface, following upward capillary movement of water and dissolved calcium carbonate through the soil
Colluvial	Transported by gravity, often referring to soil as it slips down a steep slope
Cosmopolitan	Occurring throughout the world
Ferricrete	A hardened deposit of iron oxide, often cemented with sand; often formed as a layer at the soil surface, following upward capillary movement of water and dissolved iron oxide through the soil
Flora	Assemblage of plant species in a particular area
Graminoid	Grass-like, including the grasses (Poaceae), reeds (Restionaceae), rushes (Juncaceae) and sedges (Cyperaceae)
I&AP	Interested and affected party (referring to the public participation process

MDS	Non-metric multidimensional scaling: a measure of the relationship of the Euclidean distance between items, and the location of each item in low-dimensional space, usually as a scatterplot
Red Data list[1]	List of rare species released by SANBI, and with the following **rankings: Critically Endangered -** a species is Critically Endangered when the best available evidence indicates that it meets any of the criteria for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild; **Endangered -** a species is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild; **Vulnerable -** a species is Vulnerable when the best available evidence indicates that it meets any of the criteria Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild; **Near Threatened –** a species is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future; **Rare –** species Taxa with limited distribution ranges within South Africa and/or known from very few subpopulations, but that are not threatened are included on the national list as species of conservation concern. In this report these species have been given the same status as NT; **Least Concern –** a species taxon is of Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category. See also Appendix 1.
SANBI	South African National Biodiversity Institute
Scree	**Colluvial a**ccumulation of broken rock fragments, often boulders, which collect along and usually at the base of the slope. Also termed talus.
Silcrete	A hardened deposit of silica formed as a layer in the soil, often at the soil surface, following upward capillary movement of water and dissolved silica through the soil
Species rarity – unweighted	Number of Red Data species (according to SANBI list) expressed as a percentage of the total number of species in an area, e.g. plant community. As per methodology in Section 3.5
Species rarity – weighted	Red Data species weighted on a sliding scale, with increase in weighting from 1 (Near Threatened (NT)) to 5 (Critically Endangered (CR)). See Section 3.5

[1] Go to link *IUCN Red List* Categories and *Criteria*: Version 3.1 - redlist en cov for more information

Vegetation	Presence and abundance of plant species in a particular area

1 INTRODUCTION

1.1 Background

1.1.1 Description of Proposed Project

This report describes and analyses the flora, vegetation, and coastal dunes of three sites along the Western, Southern and Eastern Cape coasts for a Conventional Nuclear Power Station proposed by Eskom. The sites, recommended for further investigation after a scoping process started in 2007, were:

- Duynefontein (Western Cape, located adjacent to the existing Koeberg Power Station, Cape Town).
- Bantamsklip (Western Cape, located 10 km south-east of Pearly Beach).
- Thyspunt (Eastern Cape, located west of Port Elizabeth near Cape St. Francis).

Two additional sites, excluded after the scoping process, were Brazil (Northern Cape, located in Kleinsee/Port Nolloth area) and Schulpfontein (Northern Cape, located in Hondeklipbaai/Kleinsee area), and are not considered in this study.

The size of each proposed site is about 2500 – 3000 hectares, with the footprint of the nuclear power station (Nuclear and Conventional Island of an EPR) expected to be approximately 200 to 280 hectares.

1.2 Terms of Reference

1.2.1 Flora & vegetation

Assess botany and general ecology of sites, including contextual analysis; provide a distinctiveness and rarity index

a Project inception

Specialist briefing and site visits (undertaken in March 2007).

b Methods & analysis

(i) General

Provide a general description of each site using GIS desktop information and mapping. Where possible, assess the coastline for approximately 100 km using existing data from pre-selected sites, to provide context and distinctiveness/ rarity index for each individual site.

(ii) Soils

Sample soils at representative localities within each site. Analyse for major soil chemistry and other parameters.

(iii) Vegetation: mapping

Map major plant communities on the detailed aerial photographs provided.

(iv) Vegetation: plots

Place duplicate plots within climax (mature) representative plant communities at each site. Input plot data into Coastec's SaSFlora database. Analyse data to illustrate vegetation uniqueness or otherwise of site and, where possible, sub-regional relationships.

(v) Flora

Sample plant species from approximately 1 ha homogenous habitats in each community, and, where possible, obtain like pre-existing data from representative sites along approximately 100 km of coastline. Where possible, identify plant specimens in the field, otherwise process specimens and submit for identification to Kirstenbosch and various taxonomic specialists. Input all flora data into the SaSFlora database. Analyse data to illustrate floral uniqueness, and site and sub-regional relationships.

(vi) Site rarity

Assess the rarity of each site using vegetation type, habitat, and plant species. Develop a model which rates these criteria to provide an overall rarity rating for each plant community within each site.

(vii) Site sensitivity

Rate the sensitivity of each plant community through ascertaining its susceptibility to erosion, fire, and drought, as well as its resilience. Develop a model which provides an overall sensitivity rating for each community.

c Product

Provide an analysis of site botany, indicating context for each site and degree of rarity and sensitivity. From this develop a conservation importance ranking and ecological implications for siting of the Nuclear Power Station. Based on the results of the study, undertake an Impact Assessment of each site.

1.2.2 Dune & coastal systems

Assess the dune and coastal systems for all sites, including contextual analysis and provide an indication of dune system distinctiveness and rarity index for each site. Note that this method aims to assess the ecological aspects of the coastal dunes present, and complements the methodology of that undertaken by the geomorphology specialist.

a Methods and analysis

(i) Mapping of dune systems and types

Map dunes using ArcMap, and classify into dune systems and dune types.

(ii) Site distinctiveness

Determine site distinctiveness/rarity on the basis of the proportion of each site's dune systems and types present, relative to the coastline being assessed.

b Product

Map dune systems and dune types along respective coastlines, including site distinctiveness and rarity. From this develop a conservation importance ranking and ecological implications for siting of the Nuclear Power Station. Based on the results of the study undertake an Impact Assessment of each site.

1.2.3 Impact assessment methodology

The objective of the assessment of impacts is to identify and evaluate all the significant impacts that might arise as a result of the nuclear power station, according to an objective set of criteria. In the Impact Assessment Phase, additional impacts were identified through the various specialist studies and through ongoing I&AP consultation.

Impacts of the preferred alternatives have been assessed following an integration workshop with the specialists, as well as through public comment. **It is important to note that the impacts of the preferred alternatives have been assessed within this specialist report.**

a Nature

This is an evaluation of the type of effect the construction, operation and management of the proposed NPS development would have on the affected environment. Will the impact change in the environment be positive, negative or neutral? This description should include what would be affected and the manner in which the effect would transpire.

b Extent or scale

This refers to the spatial scale at which the impact will occur. Extent of the impact is described as: low (site specific – affecting only the footprint of the development), medium (limited to the site and its immediate surroundings and closest towns) and high (regional and national).

c Duration

The lifespan of the impact is indicated as low (short-tern – 0-3 years), typically impacts that are quickly reversible within the construction phase of the project), medium-term (4-8 years) and high (long-term, 9 years or more and continuing for the operational lifespan of the power station).

d Intensity or severity

This is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Would the activity destroy the impacted environment, alter its functioning, or render it slightly altered? The specialist study must attempt to quantify the magnitude of the impacts and outline the rationale used.

e Impact on irreplaceable resources

This refers to the potential for an environmental resource to be replaced, should it be impacted. A resource could possibly be replaced by natural processes (e.g. by natural colonisation from surrounding areas), through artificial means (e.g. by reseeding disturbed areas or replanting rescued species) or by providing a substitute resource, in certain cases. In natural systems, providing substitute resources is usually not possible. But in social systems substitutes are often possible (e.g. by constructing new social facilities for those that are lost). Should it not be possible to replace a resource, the resource is essentially irreplaceable e.g. Red Data species that are restricted to a particular site or habitat of very limited extent.

f Consequence

The consequence of the potential impacts is a summation of the above criteria, namely the extent, duration, intensity and impact on irreplaceable resources.

g Probability of occurrence

The probability of the impact actually occurring is based on the professional experience of the specialist with environments of a similar nature to the site and/or with similar projects. Probability is described as low (improbable), medium (distinct possibility), and high (most likely). Probability is defined as the probability of the impact occurring, not as the probability of the activities that may result in the impact. The fact that an activity will occur does not necessarily imply that an impact will occur.

h Significance

Impact significance is defined to be a combination of the consequence (as described above) and probability of the impact occurring. The relationship between consequence and probability emphasises that the risk (or impact significance) must be evaluated in terms of the seriousness (consequence) of the impact, weighted by the probability of the impact actually occurring. If the consequence and probability of an impact is high, then the impact will have a high significance. The significance defines the level to which the impact will influence the proposed development and/or environment. It determines whether mitigation measures need to be identified and implemented and whether the impact is important for decision-making.

i Degree of confidence in predictions

Indicate the degree of confidence (low, medium or high) there is in the predictions made for each impact, based on the available information and level of knowledge and expertise.

j Mitigation measures

Mitigation measures are designed to reduce the consequence or probability of an impact, or to reduce both consequence and probability. The significance of impacts has been assessed both with mitigation and without mitigation.

k Legal requirements

List the relevant South African legislation and permit requirements pertaining to the development proposals. Provide reference to the procedures required to obtain permits and describe whether the development proposals have the potential to trigger applicable licensing or permit requirements.

l Cumulative impacts

These are the incremental impacts of the activity and other past, present and future activities on a common resource.

1.3 Assumptions and limitations

Owing to budgetary constraints, the detail of the botanical and dune ecological work at the three sites is naturally limited. The size and complexity of each site would necessitate studies of weeks or even months to ascertain the true nature of the systems and habitats present. Nevertheless, the detail contained in this report is considered sufficient to make confident recommendations for the location of the proposed infrastructure. However, once a site has been prioritised for development, detailed ecological studies would need to be undertaken to fine-tune location of these facilities.

2 BACKGROUND

2.1 The nuclear facility

Eskom proposes constructing a Nuclear Power Station (NPS), with a power generation capacity of up to 4000 MW, at each of three locations, two along the Western Cape coast and one on the Eastern Cape coast. Each NPS is likely to require some 200 to 280 ha for the Nuclear and Conventional Islands of an EPR.

Potential impacts of a NPS on the botany and dune ecology are likely to include the following (amended after responses from the initial scoping process):

- Physical footprint of structure;
- Access road alternatives;
- Powerline servitudes and pylons, between NPS and HV yard, but not further; and
- Spoil sites.

The impact of the above to be investigated *vis-a-vis* their role in affecting:

- The disturbance of species, habitats and ecosystem functioning through activities associated with construction; and
- The disturbance of species, habitats and ecosystem functioning through activities associated with the operational phase of the NPS.

2.2 Legislative Framework

Biodiversity in general, and vegetation/plant life in particular, should form one of the focal points of an EIA where one or more of the following aspects are relevant (adapted from Brownlie, 2005):

1) ***The presence of important biodiversity pattern,*** such as Critical Biodiversity Areas, protected/threatened ecosystems, protected/threatened species, and/or where there are high levels of endemism.

2) ***Important ecological processes or process areas***, such as Ecological Support Areas, regional or local ecological corridors, important habitat for threatened, protected or commercially valuable species, highly dynamic or unstable systems, or the need to maintain key processes which ‘drive’ ecosystems (e.g. fire, coastal sediment movement, etc.).

3) ***Important ecosystem goods or services in the area***, which support lives or livelihoods, such as reserves of harvestable goods, wetlands, estuaries or reefs which regulate water supply and coastal protection, natural or living landscapes or species having heritage or other cultural value, and unique opportunities offered by biodiversity to enhance development (e.g. ecotourism).

4) ***Potential of the proposed activity***, because of its nature, to pose a significant threat either directly or indirectly to biodiversity. Where pollution is an issue, a biodiversity specialist is invariably needed to address effects on valued receiving ecosystems and species.

5) ***Potential of a component of biodiversity or receiving ecosystems*** to pose a threat to the proposed activity (e.g. disease vectors, flooding, waterlogging, sea level rise, sand movement, etc.).

With regard to the legal framework within which a botanical study takes place, the following 'bigger picture' aspects are important:

1. South Africa has ratified a number of international conventions, namely the Convention on Biological Diversity, the Ramsar Convention (on wetlands of international importance especially as waterfowl habitat), The Bonn Convention (on conservation of migratory species of wild animals) and the World Heritage Convention.

   South Africa thus has an obligation to protect species and ecosystems that warrant national or local protection, including: ecosystems that are threatened, important for maintaining key ecological or evolutionary processes and/or functions, ecosystems that contain rich biodiversity or large numbers of threatened or endemic species, with social, economic, cultural or scientific value; species and communities of species that are threatened, related to domesticated or cultivated species, and/or have medicinal, agricultural or other economic, social, cultural or scientific significance; genotypes with social, scientific or economic significance. In addition, it must use indigenous biological resources sustainably; and share the benefits of biodiversity equitably.

2. South Africa has a number of legal tools at national level aimed at conserving biodiversity and natural systems. In addition, biodiversity plans have been developed at national, provincial and local levels to prioritize conservation efforts. The laws and policies are summarised in Table 2.2.1 below.

3. South Africa has a number of formally protected areas (such as National Parks and Provincial Nature Reserves), as well as World Heritage Sites and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) Biosphere Reserves that reflect priority areas for biodiversity conservation. The Namaqua National Park just east of Schulpfontein, and the Kogelberg Nature Reserve are good examples.

Table 2.2.1: Laws and plans relating to the natural environment	
Constitution of the Republic of South Africa (Act 108, 1996), article 24 (b) – (c)	*"everyone has a right to have the environment protected, for the benefit of present and future generations, through the reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation, and secure ecologically sustainable[2] development and use of natural resources while promoting justifiable economic and social development.* **Any NPS must ensure that the above is upheld, for example in creating a multiple-use conservation facility along the lines of the Koeberg Private Nature Reserve.**
National Environmental Management Act, 1998 (NEMA) (Act No. 107 of 1998)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) states in s2(4)(k) that the environment is held in public trust for the people, the beneficial use of resources must serve the public interest and the environment must be protected as the people's common heritage. Section 2(4)(a) specifies that sustainable development requires the consideration of all relevant factors including the following: ▪ that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ▪ that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; ▪ that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions ▪ that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied; ▪ that equitable access to environmental resources, benefits and services be pursued to meet basic human needs and ensure well-being. Special measures may be taken to ensure access by categories of persons disadvantaged by unfair discrimination, ▪ that pollution and degradation of the natural environment be avoided, or, where they cannot altogether be avoided, are minimised and remedied, ▪ that landscapes and sites that constitute the nation's cultural heritage be avoided, or where they cannot be altogether avoided, are minimised and remedied, ▪ that sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource

[2] The term 'sustainable' in relation to biological resources is defined as 'sustainable' in relation to the use of a biological resource, means the use of such resource in a way and at a rate that

a) *would not lead to its long term decline*
b) *would not disrupt the ecological integrity of the ecosystem in which it occurs and*
c) *would ensure its continued use to meet the needs and aspirations of present and future generations of people*

	usage and developmental pressure. Section 28 imposes a 'duty of care' obligation for the environment on every person with regard to taking reasonable measures to prevent pollution or degradation of the environment or, where unavoidable, to minimize and rectify such pollution or degradation. **These issues must be included and used as the benchmark against which the potential significance of impacts in the impact assessment can be measured. In addition, to ensure that these principles are met, appropriate conditions must be included in the construction and operational environmental management plans.**
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The objectives of this Act are within the framework of the National Environmental Management Act, include: ▪ The management and conservation of biological diversity within the Republic of South Africa and the components of such biological diversity ▪ The use of indigenous biological resources in a sustainable manner; and ▪ The fair and equitable sharing among stakeholders of benefits arising from bio prospecting involving indigenous biological resources; and ▪ Giving effect to ratified international agreements relating to biodiversity which are binding on the Republic. The Act, amongst others, provides the framework for biodiversity management and planning. It provides (s52) for the listing of threatened (critically endangered, endangered or vulnerable) and protected ecosystems (of high conservation value or of high national or provincial importance although not listed as threatened) and for activities or processes within those ecosystems to be listed as 'threatening processes', thus triggering the need to comply with the NEMA EIA regulations. Promulgation of such lists is imminent[3]. The Act establishes the South African National Biodiversity Institute (SANBI), with a range of functions and powers (Chapter 2 Part 1). It also provides for the listing, control and eradication of invasive species (currently the responsibility of the Conservation of Agricultural Resources Act, 1983). **Land within any NPS site should be formally declared as a nature reserve and managed accordingly.**

[3] Until threatened ecosystems and habitats are listed, South Africa's Red Data books and electric datasets of threatened species, and the NBSA list different categories of threatened vegetation types and ecosystems (Critically Endangered, Endangered, Vulnerable)

National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)	The objectives of this Act within the framework of the National Environmental Management Act, include the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes in order to: ▪ Protect areas with significant natural features or biodiversity ▪ Protect areas in need of long-term protection for the provision of environmental goods and services ▪ Provide for sustainable flow of natural products and services to meet the needs of a local community; involvement of private landowners. The Act provides for the involvement of parties other than organs of State in the declaration and management of protected areas. **Land within any NPS should be formally declared as a protected area in perpetuity, and managed accordingly.**
National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008)	The Act's intention, through integrated coastal and estuarine management, is to ensure that development and the use of natural resources within the coastal zone is socially and economically justifiable and ecologically sustainable, amongst others, through appropriate regulation, management, protection, conservation and rehabilitation measures. The Act focuses on regulating (by restricting or controlling) human activities within, or that affect the 'coastal zone'. The '*coastal zone*' is defined as the area comprising coastal public properly, the coastal protection zone, coastal access land and coastal protected areas, the seashore, coastal waters and the exclusive economic zone and includes any aspect of the environment on, in, under and above such area. The *coastal protection zone* includes any land situated wholly or partially within 1 km of the HWM which, when this Act came into force, (i) was zoned for agricultural or undetermined use; or (ii) was not zoned and was not part of a lawfully established human settlement, and any land within 100 m of the HWM. This coastal protection zone, through regulation, management and/or restrictions, aims (s17) to: • protect its ecological integrity, natural character and socioeconomic/ aesthetic values; • avoid increasing the severity or effect of natural hazards in this zone; • protect people, property and economic activities from dynamic coastal processes *(including sea level rise)*; • maintain the natural functioning of the littoral active zone; • maintain the productive capacity, and make land available to the state or authorized persons for specified purposes. The MEC must establish coastal set-back lines to prohibit or restrict the building, erection, alteration or extension of structures sea-ward of

	these lines. The lines may be wholly or partially outside the coastal zone. The Act makes the preparation of a provincial and municipal coastal management plans compulsory within a specified time period, and prescribes its contents. It also provides for coastal planning schemes to facilitate its objectives. The Act also regulates the discharge of effluent into coastal waters as well as the incineration or dumping of waste at sea. Development in the coastal zone must take into account both the impacts of the activity on the coastal environment (including cumulative impacts), and the impacts of coastal environmental processes on that activity. Any activity within the coastal protection zone should be consistent with its purpose (s17). **For any NPS facility, the coastal zone, which will receive the greatest impact in constructing and operating such a facility, must be included as part of the conservation process for that particular facility. Included should be a coastal corridor and setback lines for development and operation, ensuring that no impact is inconsistent with the purpose of a coastal protection zone IF land lies within this zone.**
Western Cape Nature Conservation Laws Amendment Act, 2000 (Act No. 3 of 2000)	This Act and associated Ordinances provide for measures to conserve the province's flora, fauna and protected areas, and deals with the permitting processes to regulate harvest/offtake/ trade in protected or endangered flora and wild animals, as well as to control noxious aquatic growths. **Conservation of flora and vegetation should be undertaken within the ambit of this Act.**
Policies and Plans	
National Spatial Biodiversity Assessment (NSBA) 2004 (Driver *et al.* 2005)	The NSBA establishes status for terrestrial, inland water, estuarine and marine ecosystems, protection levels and conservation priorities at a 1: 250000 scale nationally and suggested implementation options for priority areas. It provides the national context for development of biodiversity plans at the sub-national and local scale. For each vegetation type a defensible target has been determined, based on protecting 75% of species occurring in that vegetation type. Ecosystem status is thus based on the percentage of the original area remaining untransformed in relation to the biodiversity target, and a threshold for ecosystem functioning. Conservation priority areas indicate where there is a need for finer scale planning, expansion of the protected area system and integration of biodiversity-compatible development and resource management across the landscape and seascape, including on private and communal land.

	These aspects should be taken into consideration when assessing the rarity and protection status of individual vegetation types in each alternative site.
National Biodiversity Strategy Action Plan (NBSAP) (DEAT 2005)	Five main strategic objectives have been identified, namely: ▪ **Strategic Objective 1**: An enabling policy and legislative framework integrates biodiversity management objectives into the economy. ▪ **Strategic Objective 2**: Enhanced institutional effectiveness and efficiency ensures good governance in the biodiversity sector. ▪ **Strategic Objective 3**: Integrated terrestrial and aquatic management across the country minimizes the impacts of threatening processes on biodiversity, enhances ecosystem services and improves social and economic security. ▪ **Strategic Objective 4**: Human development and well-being is enhanced through sustainable use of biological resources and equitable sharing of the benefits. ▪ **Strategic Objective 5**: A network of protected areas conserves a representative sample of biodiversity and maintains key ecological processes across the landscape and seascape. **Each NPS facility can potentially contribute to each of the above objectives, in particular the last two.**
National Biodiversity Framework (DEAT, 2009)	The NBF provides a framework for conservation *and* development. It aims to focus attention on the most urgent strategies and actions required for biodiversity management, and assign roles and responsibilities to key stakeholders (including the State). It provides a five-year strategy, drawing out immediate priorities within each of the 5 Strategic Objectives of the NBSAP. **It is important to note that one of the priority areas in this NBF is the development of a national policy on biodiversity offsets. This policy will in all probability require developers (in this case Eskom) to provide offsets to the national conservation estate, commensurate with the residual negative impacts on biodiversity of development.**
Draft National Strategy for Sustainable Development (DEAT 2006)	This Strategy stems from Section 24 (b) of the Constitution and particular the phrase *"secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".* Although still in development, the final product is set to be used by government and stakeholders to enhance South Africa's long term planning capacity. It would specifically influence national and provincial development strategies, such as the National Spatial Development Perspective, the Provincial Growth and Development Strategies and other cross-sectoral development programmes. The draft National Strategy notes that the nation's biodiversity provides critical ecosystem services on which socioeconomic systems depend. Our ecosystems

	are the basis of our society and our economy; they provide vital services and are of great use and non-use value to society. **Conservation approaches at any NPS facility should take cognisance of this policy statement and should strive to ensure that such approaches include the sustainable use of natural resources in NPS land, at the same time promoting local justifiable development.**
Towards a Sustainable Development Implementation Plan for the Western Cape: Concept Paper on sustainable development. (DEA&DP 2005); and the provincial Sustainable Development Implementation Plan (PSDIP) Final Draft for public comment (DEA&DP 2006)	This concept paper and implementation plan provide for: ▪ a framework to assist in developing a common understanding of the concept of “sustainable development” and enables decision makers to assess the extent to which their proposed policies, strategies and projects contribute to sustainability. ▪ The PSDIP recognises the inter-dependencies of economic growth, social equity and ecosystem services, and the need to stay within the ecological limits of the natural resource base. ▪ Four priority areas, including (Priority Area 3) promoting resource efficiency and sustainability, and (Priority Area 4) – safeguarding ecosystem services. ▪ Within Priority Area 4, priority actions include the development of a biodiversity accounting system, implementing programmes that promote biodiversity conservation, and expanding conservation areas and networks of protected areas. **Any NPS within the Western Cape (i.e. Duynefontein and Bantamsklip) needs to address the protection and sustainable use of ecosystem services whilst contributing to the expansion of conservation networks.**

Western Cape Provincial Growth and Development Strategy Green Paper (Department of the Premier 2007)	Economic growth is a prerequisite for boosting job creation, better quality human settlement and improved human well-being. The PGDS notes that: ▪ Environmental integrity is 1 of 4 key pillars of the 'shared growth and integrated development' path to 2014, with growth, equity and empowerment. ▪ Biodiversity embraces the richness in species as well as the wealth in endemic plants and animals. Protecting the natural resource base is essential to any economic and socially sustainable system, even when the full economic value of natural resources has not yet been calculated. ▪ Biodiversity protection and the protection of ecological hot spots are internationally recognized imperatives governed by specific international agreements. Land cover change is the most significant driver or decline in ecosystem health. The Strategy aims for a 50% improvement in environmental condition by 2014 (through urban edge and other guidelines, target is to reduce biodiversity loss and urban/agricultural land encroachment). **Either NPS site in the Western Cape must comply with the above through protecting the natural resource base and reducing transformation of land cover.**
Western Cape Spatial Development Framework (2005 and 2009)	The WCSDF has been approved as a formal Structure Plan in terms of the Land Use Planning Ordinance (1985). Its purpose is to guide spatial development in the landscape and investment of public resources to achieve development objectives. The WCSDF draws on bioregional planning principles and applies broad Spatial Planning Categories linked to resource conservation, amongst others, and differentiating between rural development beyond urban edges, and urban/ settlement areas. 'Core' and 'buffer' SPCs relate directly to valued biodiversity or natural resources; they incorporate ecological corridors e.g. along rivers and coastlines. **Planning of the two proposed NPS facilities in the Western Cape needs to take cognisance of the WCSDF.**
Guidelines for development in the Western Cape: biodiversity offsets (2007)	Echoing the intention of national government to develop a national policy for biodiversity offsets, the Western Cape (2007) and KwaZulu-Natal (2009) have developed draft guidelines for biodiversity offsets in these provinces. The guidelines explain where offsets would be required, the quantum of offset that would be appropriate and their location in the landscape. **It is important to note that one of the priority areas in this NBF is the development of a national policy on biodiversity offsets. This**

	policy will in all probability require developers (in this case Eskom) to provide offsets to the national conservation estate, commensurate with the residual negative impacts on biodiversity of development.

3 STUDY APPROACH (METHODOLOGY)

3.1 General

Sites were visited during the spring months (generally between late August and late October, depending on the region) and on the following dates: Duynefontein – 10, 11, 14, & 26 September 2007. The site was also visited on 31 October 2007 for the discontinued PBMR study and some of this data from this study has been used in the present analysis; Bantamsklip: 3 to 5, 19 & 20 October 2007. The site was also visited on 20 January 2008 to advise on the location of drilling on the site and several species lists were augmented that day; Thyspunt: 11 to 14 October, 8 & 9 December 2007. Additional visits were also undertaken on 14 & 15 July 2008 to assess a new road alignment to the site - and several additional species were collected during this time. Further visits were conducted in early September 2009 to review the new corridors for the proposed western, central (north-south) and eastern access roads. A preliminary visual assessment, augmented by the initial desktop mapping exercise reported in the inception report (Low, 2007) enabled broad plant communities to be determined prior to subsequent evaluation. These then provided a basis for further detailed assessment of the flora and vegetation at each site.

3.2 Soils

In each of the above communities, four soil subsamples (15 cm deep) were collected, bulked and reduced to approximately 1 kg in mass, and then air dried. All samples were then sent to BemLab, Somerset West, for analysis of the following parameters: pH, resistance, total phosphorous, Bray no. 2 phosphorus, exchangeable cations (Ca, Mg, K, Na), total nitrogen, total carbon, cation exchange capacity and texture. These parameters were chosen as they provide key aspects of soil characteristics as they relate to the plant communities and general ecology of each habitat.

3.3 Vegetation

3.3.1 Mapping

a) For field work, boundaries of plant communities were drawn onto aerial photographic composites prepared for each site by EcoSol GIS (Bantamsklip: 1:10 000; Koeberg: 1:10 000; Thyspunt: 1:2 000, enlarged to 1:6 000 for more detailed mapping). Hard copy maps were in turn digitised by EcoSol and prepared as shape files within ArcMap.

b) After ground-truthing in the field, detailed mapping of plant communities was undertaken using high resolution (approx. 1:1000) aerial photographs prepared especially for the study.

3.3.2 Field sampling

In parallel with the species sampling, paired plots or relevés were placed within each plant community. Plots were generally 10 m x 10 m and these were found to be suitable for capturing the diversity and cover-abundance of individual species comprising each community. In each plot all species were recorded and a cover-abundance rating ascribed for the individual species, based upon the Braun-Blanquet scale (r = barely present, odd individuals); + = present but <1% cover); 1 = 1 to 5 % cover, or many individuals with lower cover; 2 = 6 to 25% cover; 3 = 26 to 50% cover; 4 = 51 to 75% cover; 5 = 76 to 100% cover.

3.4 Flora

At each of the three sites, all plant species were sampled from a homogeneous area of approximately 1 ha in each broad plant community identified above. Where possible, species were identified in the field or, if not known, pressed and labelled, and dried for later naming. Specimens not identified in the field or not being suitable for submission (e.g. lacking suitable flowering material) were ignored in a minority of cases. Dried specimens prepared in this way were submitted to Kirstenbosch (most plant groups) or to the following specialists (with plant family in brackets): Dr Cornelia Klak (Mesembryanthemaceae/ Aizoaceae); Mr Terry Trinder-Smith (Rutaceae) (both at the Bolus Herbarium, University of Cape Town), Dr Peter Bruyns (Apocynaceae, Crassulaceae & Euphorbiaceae (Mathematics Department, University of Cape Town), Dr Muthama Muasya (Cyperaceae) (Botany Department, University of Cape Town), and Ms Els Dorrat (Restionaceae).

Species names were entered into Coastec's SaSFlora site and species database for the Cape and Karoo floras (SaSFlora, 1998 – 2011), with each plant community sample(s) representing a different site in each of the three localities.

3.5 Rarity

Degree of rarity was defined as degree of irreplaceability (*sensu* Cowing *et al*., 1999), where high irreplaceability (e.g. where very little remains of an original natural system) gives a high rarity ranking. Rarity classes were calculated for each site, using the following parameters (see box):

- **Vegetation Type** (after Rouget *et al*., 2004); **Habitat**: a semi-objective assessment was made of habitat rarity by evaluating previous assessments in the literature and rating contextual analyses where possible (greater site distinctiveness = greater habitat rarity). Highly threatened habitats such as wetlands, always received a high score due to their exploitation and general losses to development and drainage.
- **Species** (% of total, unweighted) (as per the latest Red Data assessment (Raimondo et al, 2009).
- **Species (weighted ranking for degree of rarity)** weighted number according to rarity classification.

RARITY

Vegetation type rarity
LT = low (1)
VU = moderate (2)
EN = Endangered (3)
CR = Critically Rare (4)

Habitat rarity
Very low = 1
Low = 2
Moderate = 3
High = 4
Very high = 5

Species rarity (% of total species in a community)
>0 – 5% = very low (1)
6 – 10% = low (2)
11 – 15% = moderate (3)
16 – 20% = High (4)
>20% = Vey high (5)

Weighted species rarity
Individual species
NT (Near Threatened) = 1
R (Rare) = 2
VU (Vulnerable) = 3
EN (Endangered) = 4
CR = Critically threatened) = 5

Weighting
>0 – 10 = very low (1)
11 – 20 = low (2)
21 – 30 = moderate (3)
31 – 40 = high (4)
>40 = very high (5)

Overall rarity model (weighting)
Vegetation type = 2
Habitat = 3
% rare species = 1
Weighted rare species total (1)

Overall rarity total
1 – 10 = very low (1)
11 – 20 = low (2)
21 – 30 = moderate (3)
31 – 40 = high (4)
>40 = very high (5)

An **overall rarity model** for each community was then developed by weighting and adding each of the above categories to provide a rarity total (see box). Calculation of rarity values is shown in Appendices 4.1.4 (Duynefontein), 4.2.5 (Bantamsklip) and 4.3.4 (Thyspunt).

3.6 Sensitivity

Sensitivity is the vulnerability of a habitat to any impact. E.g. a dune system would be much more vulnerable to development than would a fynbos system on sandstone. Several sensitivity categories were assessed: **erosion potential**, **proneness to fire**, **susceptibility to drought** and **resilience** (this is a measure of a particular plant community to recover after an impact) (values here are a reverse of the first three: i.e. high resilience infers low sensitivity).

An **overall sensitivity model** was then developed for each community in which each criterion was weighted and then added, to provide a total for sensitivity (see box for values). Calculation of sensitivity values is shown in Appendices 4.1.4 (Duynefontein), 4.2.5 (Bantamsklip) and 4.3.4 (Thyspunt).

SENSITIVITY

Erosion potential
Very low = 1
Low = 2
Moderate = 3
High = 4
Very high = 5

Susceptibility to drought
Very low = 1
Low = 2
Moderate = 3
High = 4
Very high = 5

Proneness to fire
Very low = 1
Low = 2
Moderate = 3
High = 4
Very high = 5

Resilience (note reverse order)
Very low = 5
Low = 4
Moderate = 3
High = 2
Very high = 1

Weighting of sensitivity criteria
Erosion = 2
Droughting = 1
Fire = 1
Resilience = 3

Overall sensitivity
1 – 5 = very low (1)
6 – 10 = low (2)
11 – 20 = moderate (3)
21 – 30 = high (4)
>30 = very high (5)

4 DESCRIPTION OF AFFECTED ENVIRONMENT

4.1 Duynefontein (existing Koeberg power station)

4.1.1 Background and general description

The geology of the site is relatively simple, being underlain by calcareous to acid Quaternary sands (*sensu* Theron *et al*., 1992; Galliers, 2000; Figure 4.1.1). These sands dominate the West Coast, north of Cape Town (Galliers, 2000) and have a strong influence on vegetation distribution (see below). Calcareous sands, chiefly of the Witzand Formation, are represented by dune cordons which run the length of the site in a south-north direction (Figure 4.4.2). According to Low & Pond (2004), most of the site comprises dunes, chiefly of the parabolic, transverse and undulating sheet (deflated parabolic) types (Figure 4.1.2), whilst all dune soils are sandy and calcareous. Older sands south-east of the site are more acidic.

Some of the largest parabolic dunefields are found at Yzerfontein and in the Koeberg-Witzand area (Tinley, 1985). Many of these have been converted (locally) to complex dune types, with bare transverse dunes replacing the vegetated parabolics. In other words there has been an extensive remobilisation of sand as the parabolic dunes have become destabilised by the wind.

The Duynefontein site was the subject of a broader West Coast conservation study in the early 1990's (Daines & Low, 1993). They found two major vegetation types present: strandveld and sand plain fynbos, with a transition between the two. Wetlands were also locally prominent. Low (2000) classified the vegetation as Dune Thicket on calcareous sand and limestone, Sand Plain Fynbos on marine-derived, leached acid sand, and a transition between the two (Figure 4.1.3), echoing the classification system of Heijnis *et al.* (1999) (Figure 4.1.4), although the latter authors recognised a variation between dune thicket on stable and mobile dunes. The latest vegetation assessment for South Africa (Mucina & Rutherford, 2006) gives these vegetation types as Cape Flats Dune Strandveld (Endangered - E) and Cape Flats Sand Fynbos (Critically Endangered - CE) (see Figure 4.1.5), although no transition is recognised. Mucina & Rutherford's (2006) placing of their Strandveld within the Fynbos Biome is not supported here and the approach of Low & Rebelo (1998), whereby this falls within a Thicket Biome, is adopted.

Daines & Low (1993) recorded 279 species for the Duynefontein (Koeberg) site, of which, at that time, eight were on the Red Data list.

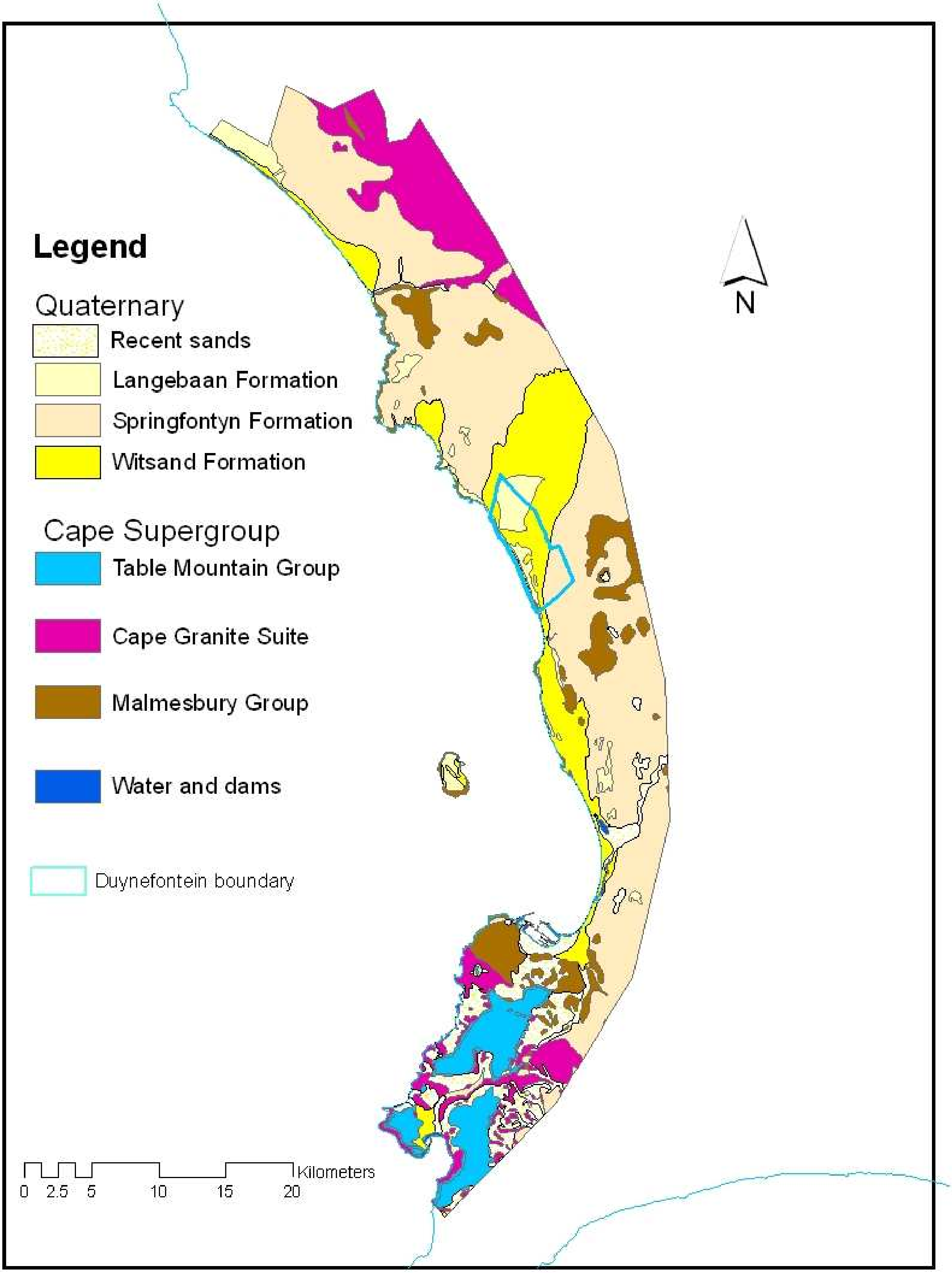


Figure 4.1.1. Duynefontein & environs coastline geology. After Galliers (2000).

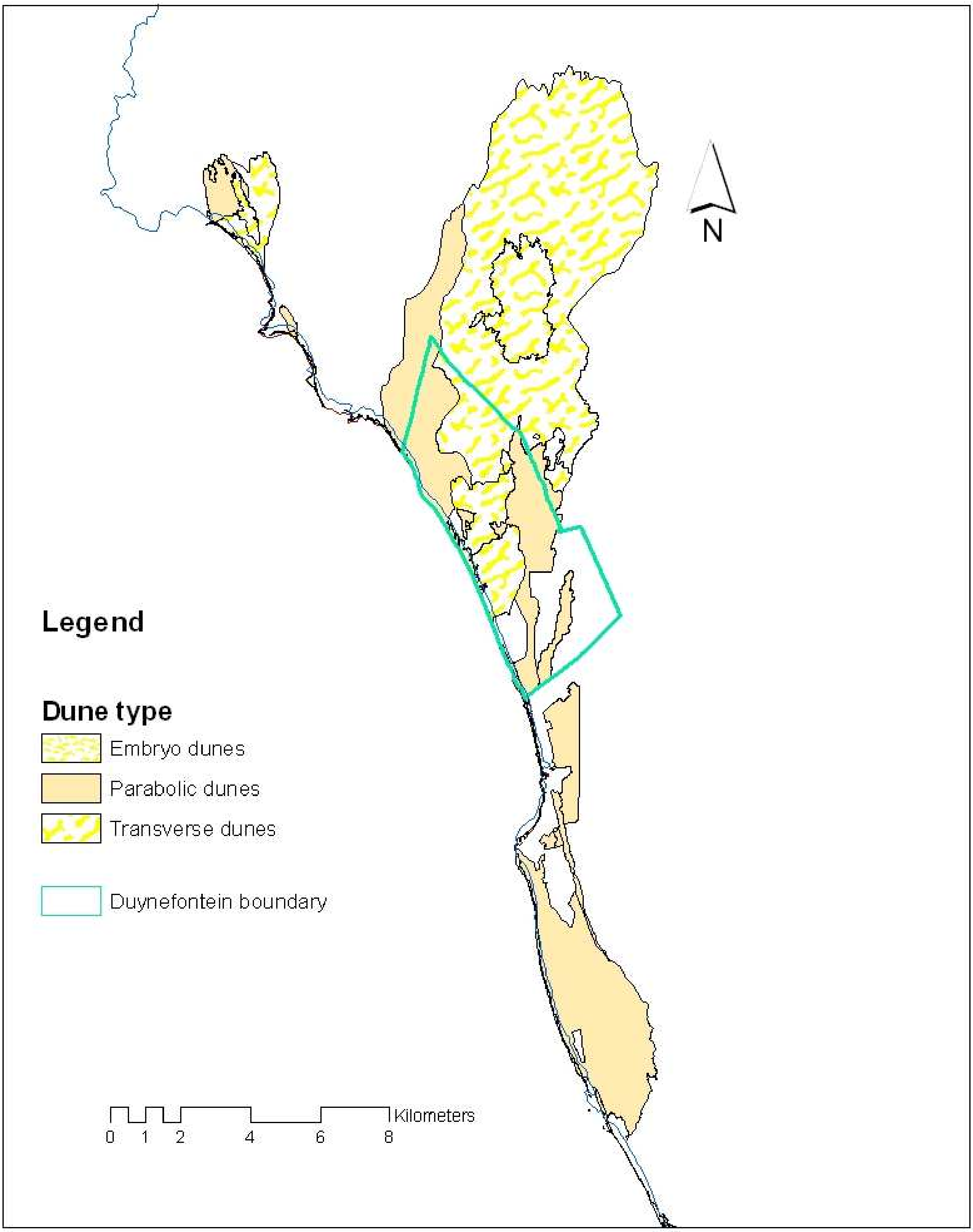


Figure 4.1.2. Distribution of dune systems between Melkbosstrand and Bokbaai, including the Duynefontein site (modified after Low & Pond, 2004)

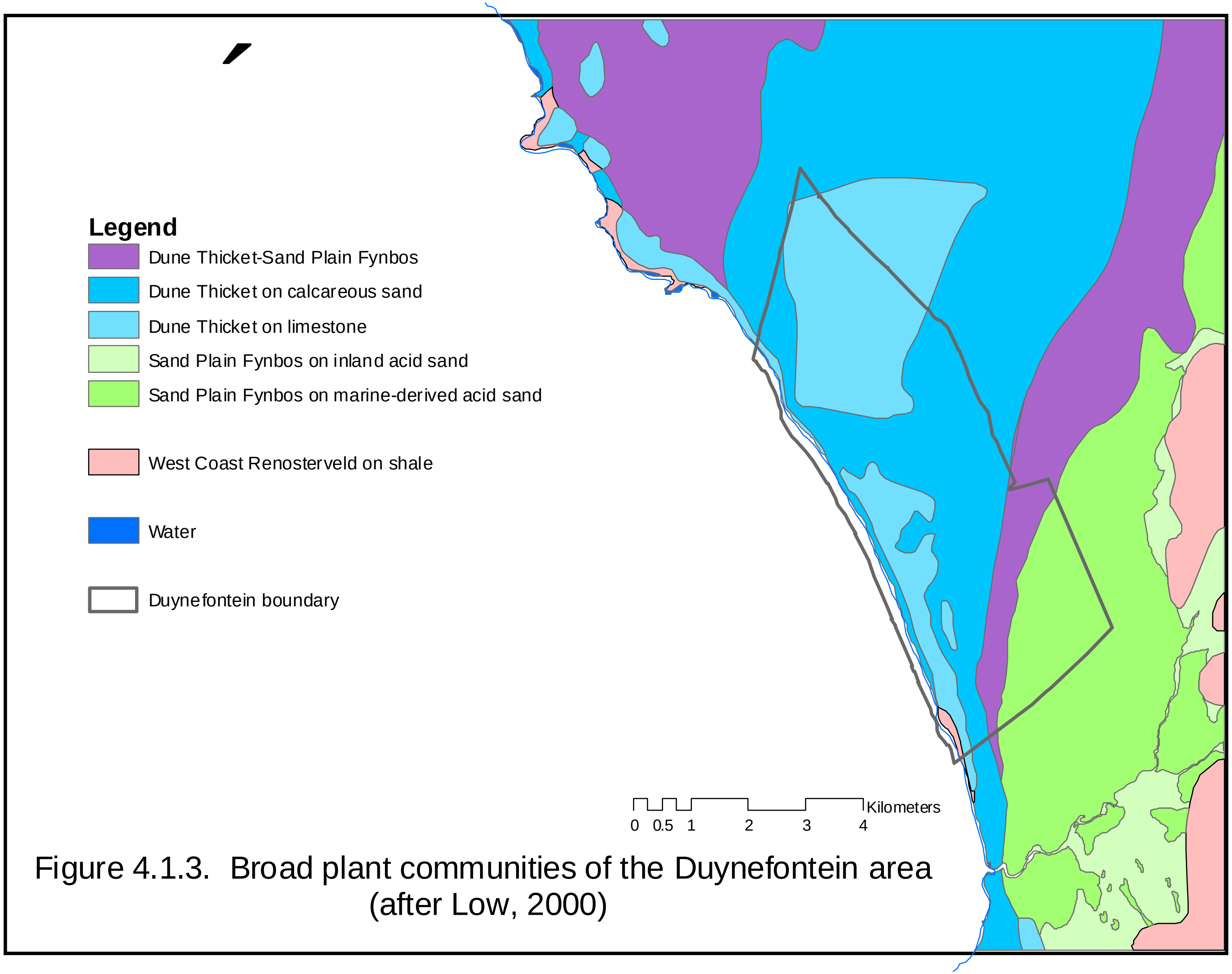


Figure 4.1.3. Broad plant communities of the Duynefontein area (after Low, 2000)

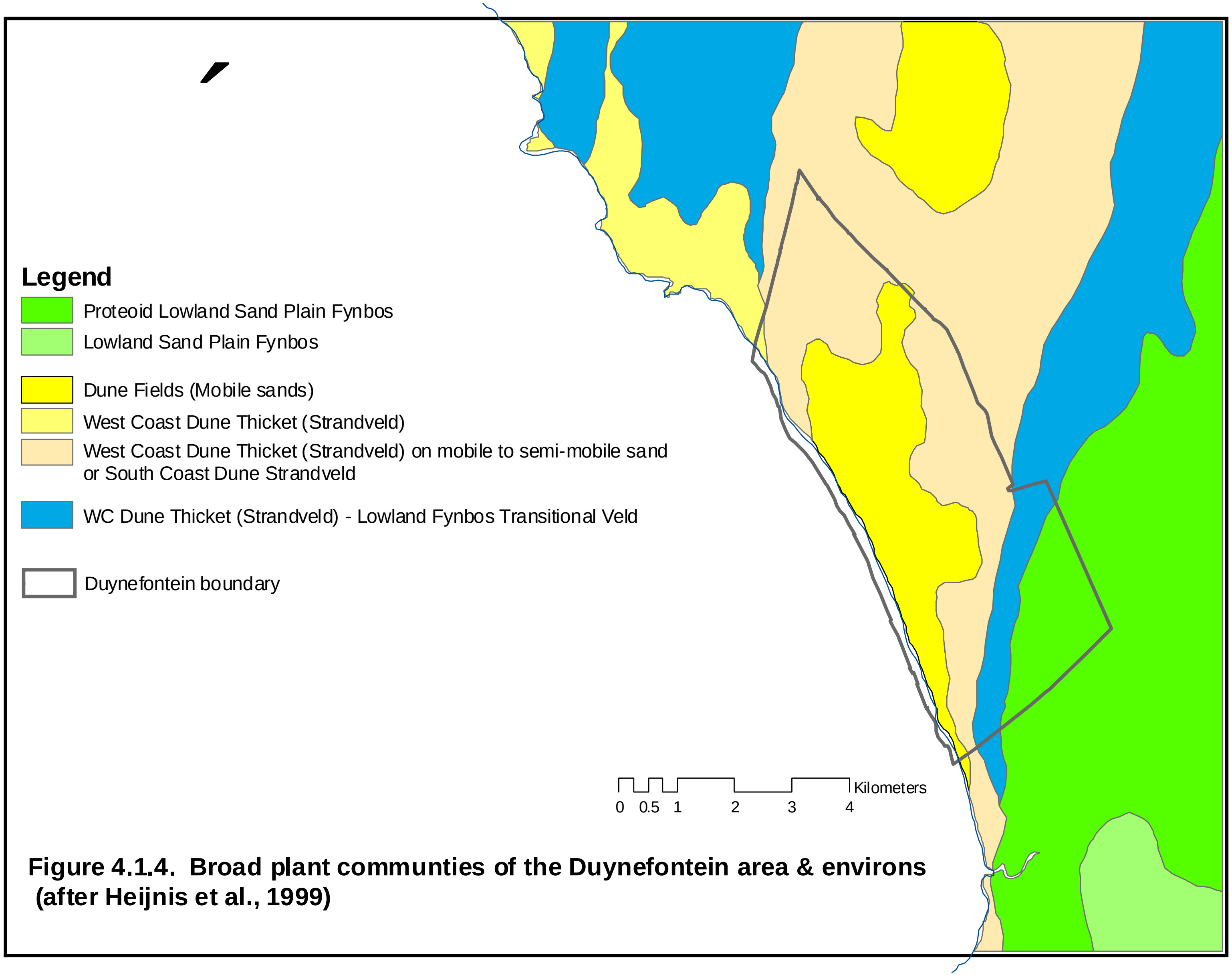


Figure 4.1.4. Broad plant communties of the Duynefontein area & environs (after Heijnis et al., 1999)

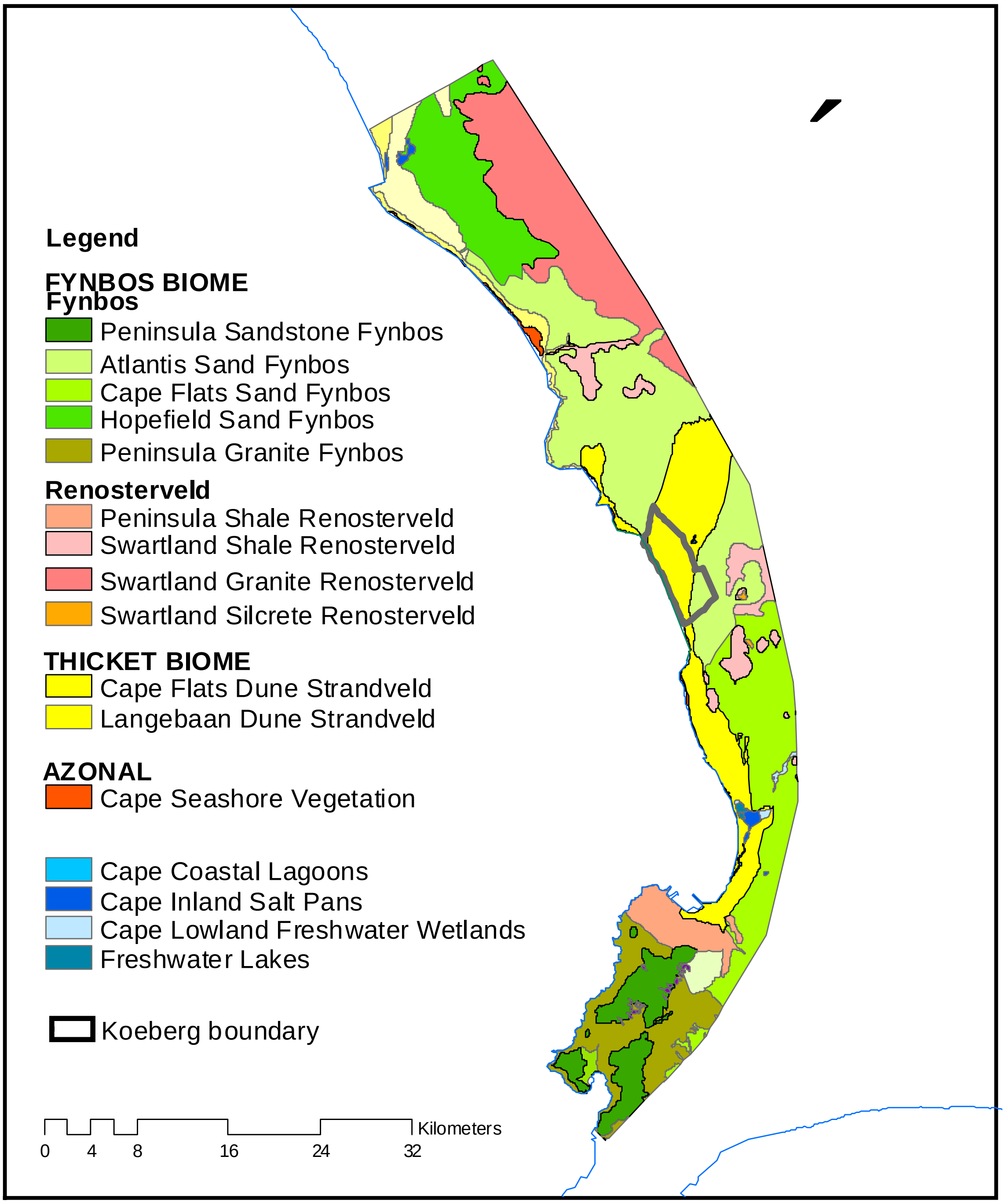


Figure 4.1.5. Vegetation types of Duynefontein & environs coastline. After Mucina & Rutherford (2006). Biomes after Low & Rebelo (1998). Note dominance of sand types in and around the study site. The proposed Duynefontein NPS site lies within the Koeberg boundary

4.1.2 Findings & discussion

a Soils

Results of the soils analysis are shown in Table 4.1.1. Key aspects are the higher exchangeable calcium and total phosphorus values in the dune sands as opposed to the south-eastern flats-supporting true fynbos. Correspondingly, pH is lower in the latter, a direct reflection of calcium levels. Figure 4.1.6 shows the grouping of soils following MDS analysis, with clear separation into calcareous and non-calcareous substrates.

Table 4.1.1. Results of analysis of selected topsoils from Duynefontein. Community descriptions in text and Table 4.1.3

Plant community	pH	Resistance (Ohm)	Total P (mg/kg)	Bray no.2 P	Exchangeable cations (cmol/kg)				Total N (%)	Total C (%)	CEC (cmol/kg)
					Na	K	Ca	Mg			
K3A	8.9	7050	983	2	0.10	0.01	14.67	0.51	0.015	0.10	4.15
K3B	8.5	4880	1121	2	0.07	0.02	11.47	0.22	0.009	0.14	2.86
K5	8.5	310	687	1	0.77	0.10	12.80	0.96	0.036	0.28	3.29
K6	7.3	2420	240	3	0.09	0.12	16.10	0.99	0.249	0.97	5.24
K7	7.7	2790	357	3	0.07	0.05	13.99	0.60	0.063	1.05	5.02
K8	7.8	3480	434	3	0.05	0.03	12.97	0.25	0.076	0.54	4.27
K10A	6.1	3420	21	7	0.03	0.03	2.53	0.38	0.037	0.16	4.84
K10B	5.9	5360	16	0	0.04	0.04	2.28	0.33	0.040	0.19	4.61
K11A	8.0	1520	1057	2	0.18	0.04	12.32	0.58	0.043	0.26	3.78
K11B	7.6	1370	811	4	0.15	0.10	14.29	0.82	0.131	0.96	4.62

pH – measured in 1M KCl; P - phosphorus; Na - sodium; K - potassium; Ca - calcium; Mg - magnesium; N - nitrogen; C - carbon. Plant community descriptions are shown in Table 4.1.3.

b Flora & vegetation

Based on the mapping exercise conducted for this study, a plant community map for Duynefontein is shown in Figure 4.1.7. Eleven broad plant communities were recognised. Brief descriptions are presented in Table 4.1.1, with images of the major plant communities being shown in Figure 4.1.8. The maps should be read in conjunction with the plot analysis, appearing in Figure 4.1.9.

Most communities are strongly influenced by dune systems, with both mobile and stable systems present.

Species lists are shown in Appendices 4.1.1 (individual communities) and 4.1.2 (composite list for Duynefontein). Details of endemic species are depicted in Appendix 4.1.3, which provides a breakdown of the distribution of plant species recorded from Duynefontein. Images of selected species are shown in Plates 4.1.1, 4.1.2 and 4.1.3, In two earlier studies undertaken by Daines & Low (1993) and Low (1993), a total of 279 species was recorded (Table 4.1.3). In the current study the total is 256 species, mainly ***because*** of less area sampled, whilst the discontinued PBMR study (Low, 2008) showed a much lower total of 115 species, as this work was restricted to only the southern portion of the site as well as a small triangle on the opposite side of the R27 road. The combined total from all of these studies is 380 species (Table 4.1.2).

Table 4.1.2. Plant species totals for different botanical studies undertaken at Duynefontein		
Study	**Red Data species**	**Total specie s**
Daines & Low (1993); Low (1993)	8	279
PBMR study (Low, 2008)	8	115
Present study	23	256
All studies	**34**	**380**

(i) Calcareous sands and limestones

Primary and foredunes (Communities K1 and K2) (Plate 4.1)

Synonyms: Boucher (1987) – Arctotheca-Cladoraphis *community; Mucina & Rutherford (2006): Cape Seashore Vegetation*

This is the pioneer vegetation of the coastal dunes. Plant cover is rarely more than 0.5 m tall and is understandably sparse to mid-dense, with both dune fynbos and dune thicket elements. This vegetation is successional to inland climax (mature) dune thicket (Cowling, 1982; and *sensu* Low & Rebelo, 1998). Mucina & Rutherford (2006) place the primary dune vegetation under the Cape Seashore Vegetation category, which is azonal and as such carries no formal relationship with the surrounding systems. These two communities are localised in a narrow strip along the coast and represent some 37.4 ha or 1.3 % of the natural vegetation within the Eskom property.

Key species include *Amphibolia laevis* kusduinevygie*, Arctotheca populifolia* sea pumpkin, *Cladoraphis cyperoides* steekriet, *Dasispermum suffruticosum* duineseldery, *Didelta carnosa* subsp. *tomentosa* seegousblom, *Ficinia lateralis* dune sedge, *Helichrysum niveum, Manulea tomentosa* duinevingertjies, *Metalasia muricata* blombos, *Morella cordifolia* dune waxberry*, Passerina ericoides* kusgonnabas, *Psoralea repens* duine-ertjie*, Pelargonium capitatum* rose-scented pelargonium, *Senecio elegans* wild cineraria, *Senecio maritimus* strandhongerblom and *Trachyandra divaricata* duinekool. Species numbers are low to moderate (51 and 46 respectively for primary dunes and foredunes) with Red Data species numbers either absent or low (Table 4.1.1; Table 4.1.3).

Mobile and semi-mobile transverse dunes (Community K3) (Plate 4.2)

Synonyms: Boucher (1987) - Arctotheca-Cladoraphis *community; Heijnis et al. (1999) – Dune Fields (Mobile Sands)/ West Coast Dune Thicket on mobile to semi-mobile sand; Low (2000) – Dune Thicket on limestone/ Dune Thicket on calcareous sand; Mucina & Rutherford – Cape Flats Dune Strandveld*

Like their primary and foredune counterparts, this plant community is pioneering, is found inland of the coast, and as would be expected, displays close linkages with the coastal primary dunes and foredunes discussed above. Again vegetation is successional to dune thicket, but only if the sand stabilises. Plant height reaches 2 m, with species such as *Seriphium plumosum* slangbos, but in general tends to be low (0.5 to 1 m). Key species include most of those mentioned in Communities K1 and K2, but with *Carpobrotus acinaciformis* suurvy, *Ehrharta villosa* pypgras, *Chrysanthemoides incana* grysbietou, *Cladoraphis cyperoides* steekriet, *Hellmuthia membranacea* knopbiesie, *Lessertia frutescens* kankerbos, *Otholobium bracteolatum* skaapbostee, *Rhus laevigata* duinetaaibos and *Ruschia macowanii* bosvygie becoming more prominent.

Compared with rest of the site, species numbers are on the low side (51) with four on the Red Data list (see Tables 4.1.1 and 4.1.3).

The transverse dune system is located between the coast and the R27, in the north of the site, and forms part of the bigger Witzand dune system (*sensu* Low & Pond, 2004) which stretches to Atlantis. Transverse dunes occupy 808.6 ha (28.9%) of the total area (Table 4.1.3).

Transition between transverse and parabolic dunes (Community K4) (Plate 4.1.6)

Synonyms: Boucher (1987) – both Arctotheca-Cladoraphis *(pioneering) and* Euclea racemosa-Ischyrolepis eleocharis *(stable); Heijnis et al. (1999) – Dune Fields (Mobile Sands)/ West Coast Dune Thicket on mobile to semi-mobile sand/ West Coast Dune Thicket; Low (2000) – Dune Thicket on calcareous sand/ Dune thicket on limestone; Mucina & Rutherford – Cape Flats Dune Strandveld*

A transition between transverse and parabolic dunes (K4) is recognised and contains elements of both communities. It was not sampled in the present study, but is represented in the map in Figure 4.1.7. This transitional community comprises elements of both mobile/semi-mobile transverse dunes, and the more stable parabolics abutting the former.

This transitional community occupies 113.3 ha (4.1%) of the site (Table 4.1.3).

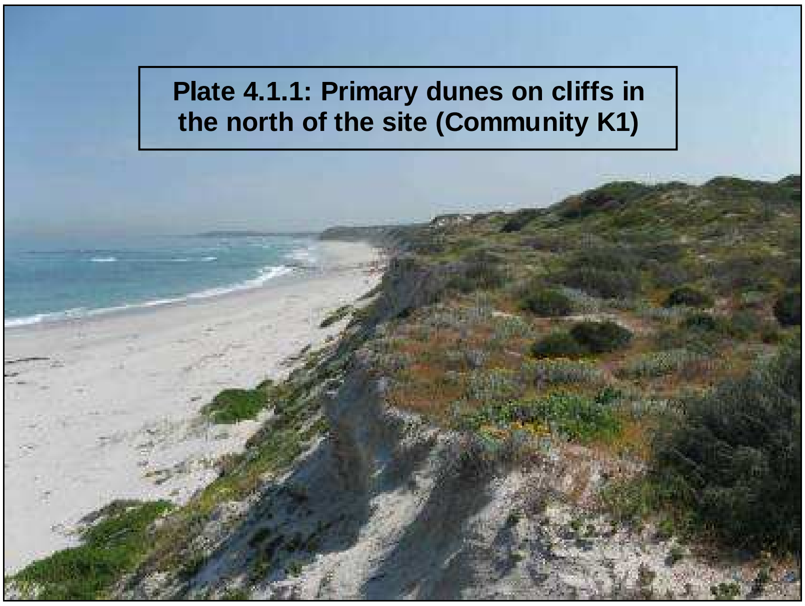


Plate 4.1.1: Primary dunes on cliffs in the north of the site (Community K1)


Plate 4.1.2: Transverse dunes (Community K3)

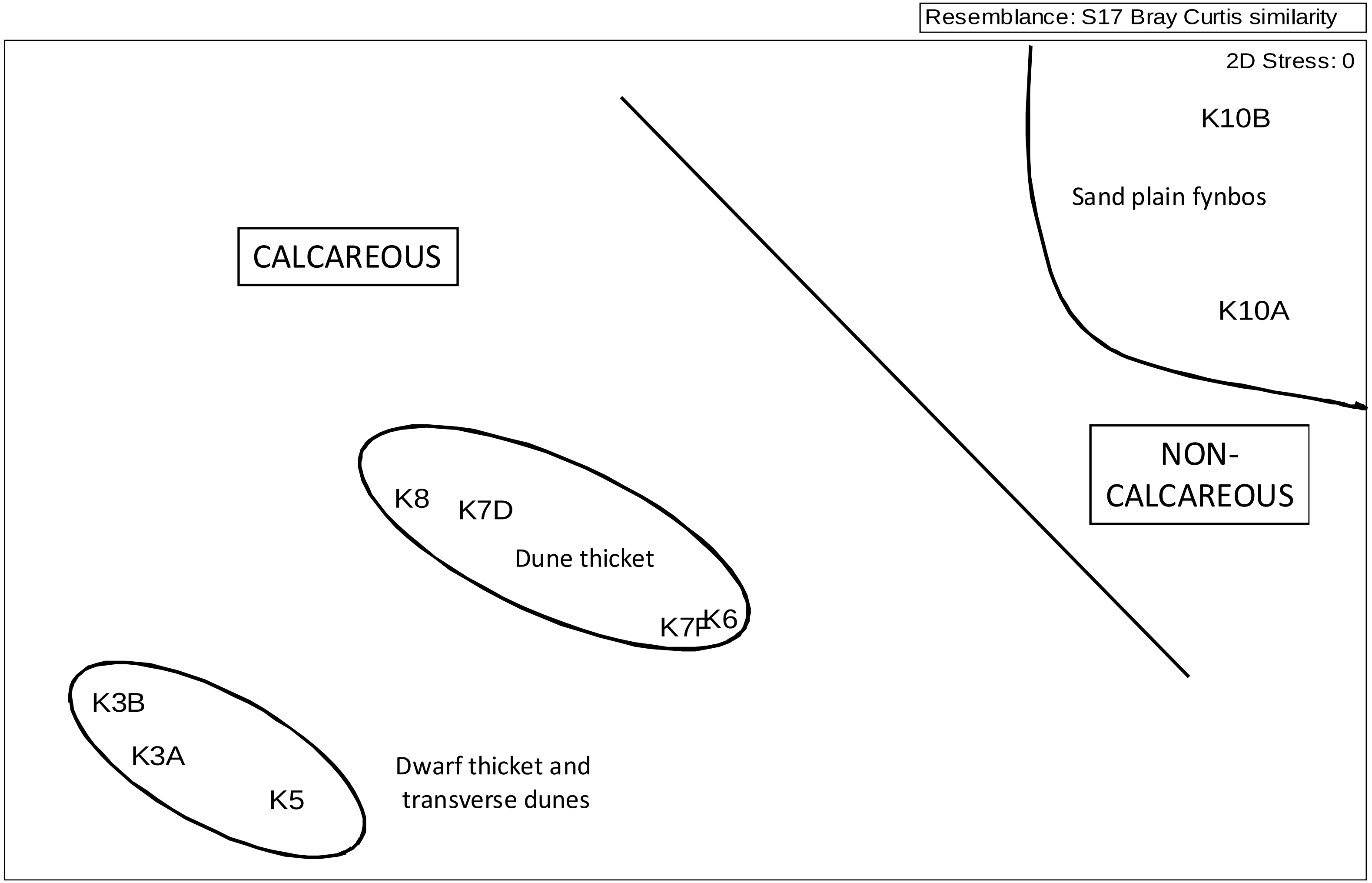


Figure 4.1.6. Analysis of selected topsoils (pH, total P, exch. Ca) from Duynefontein. Separation into acid (sand plain fynbos) (top left) and calcareous sands clearly apparent, as is the general distinction between primary dunes and dune thicket

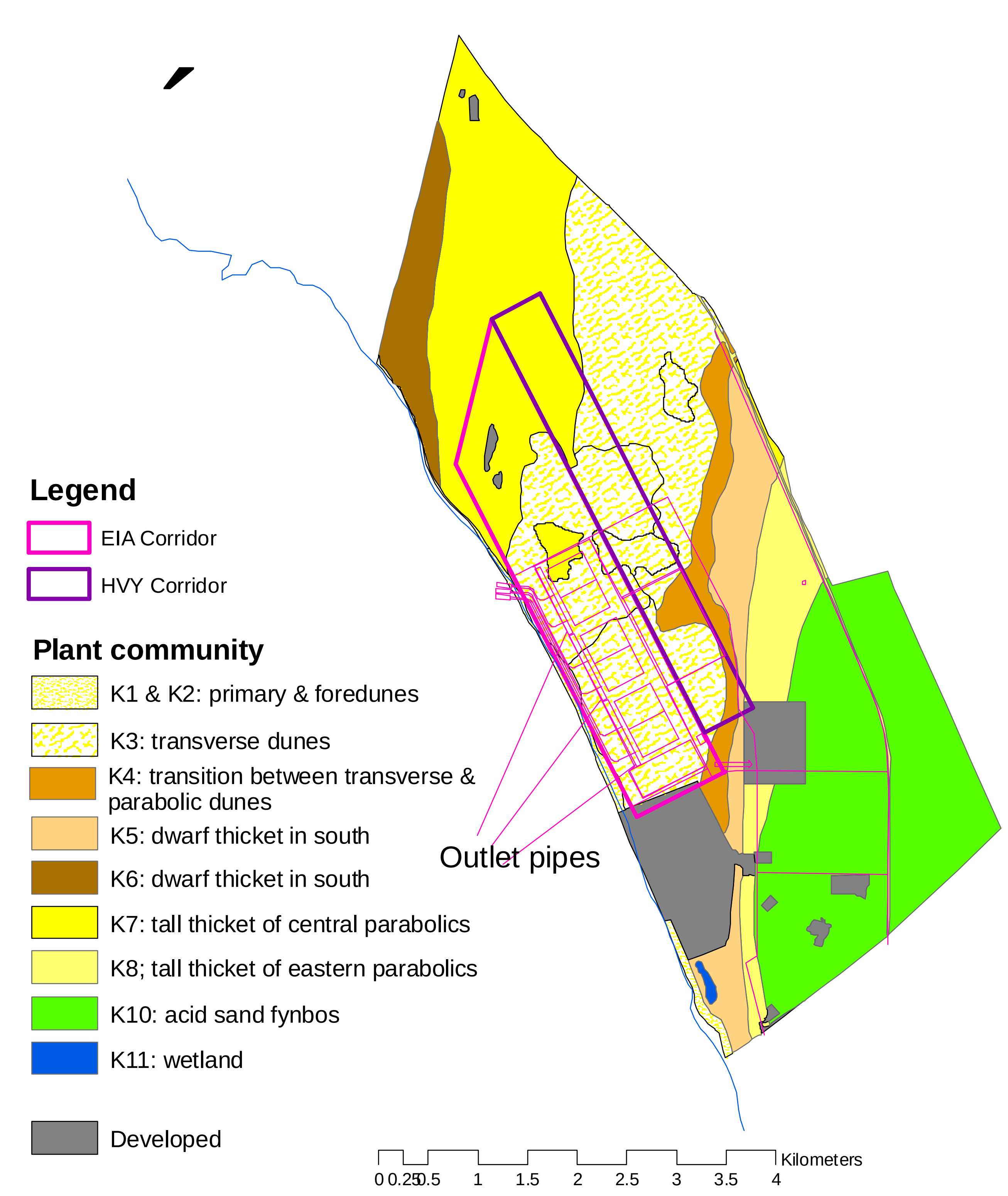


Figure 4.1.7. Plant communities at Duynefontein. See Table 4.1.2 for community descriptions. K9 (calcrete) not mapped

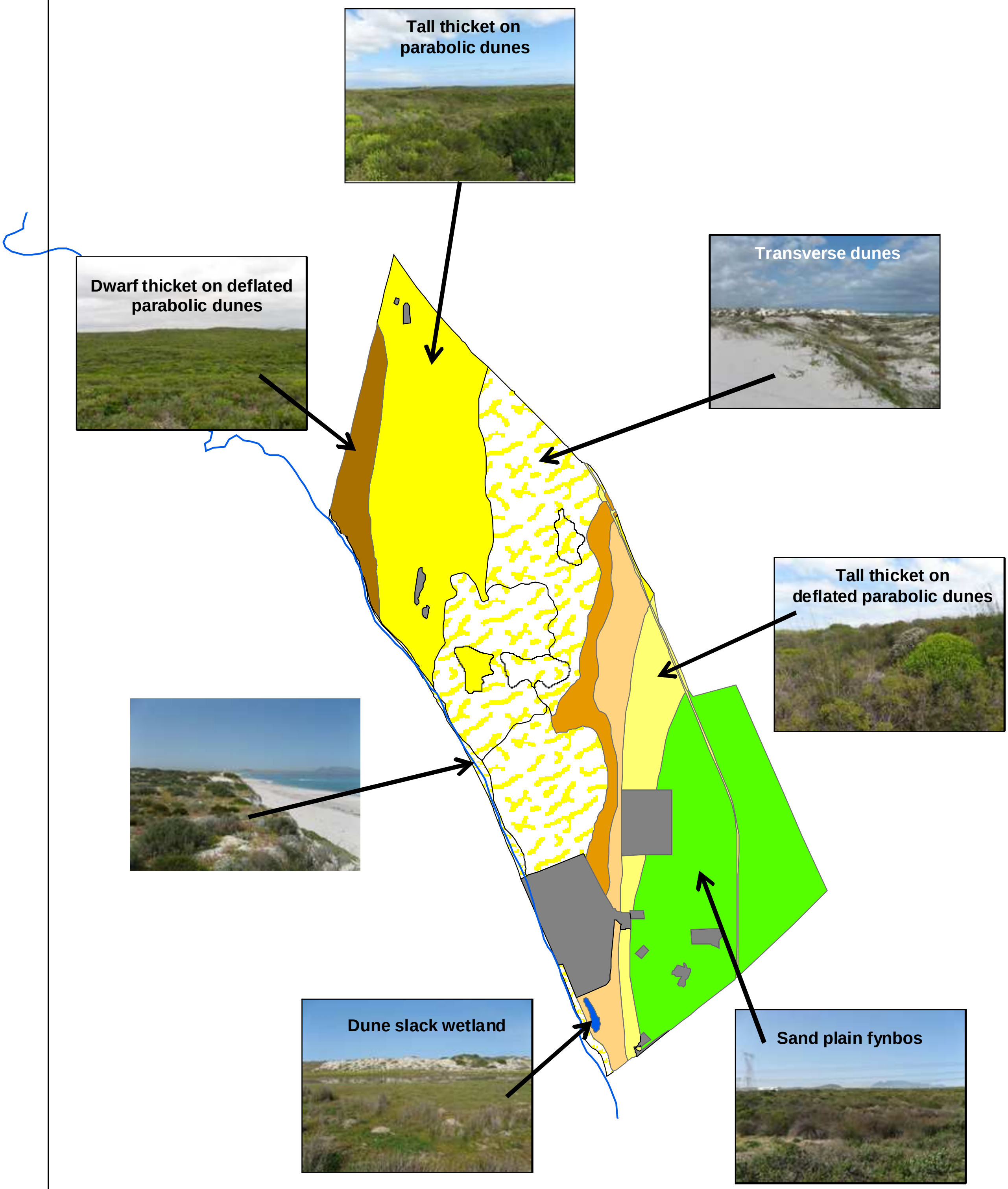
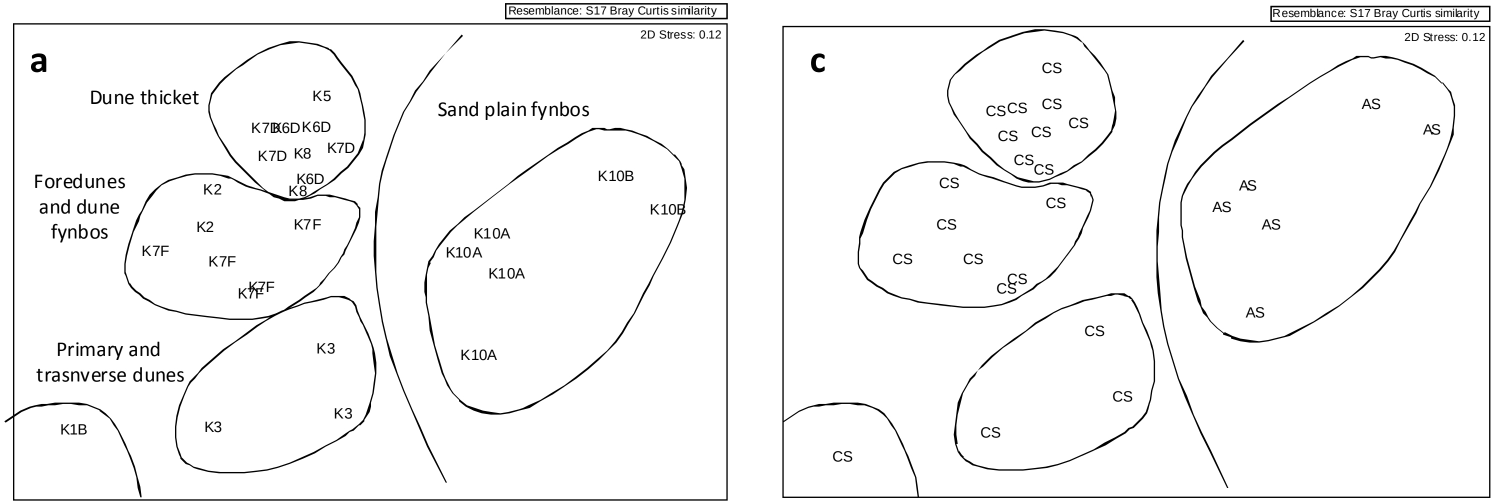


Figure 4.1.8. Images of plant communities at Duynefontein. For interpretation of map, see Fig. 4.1.7



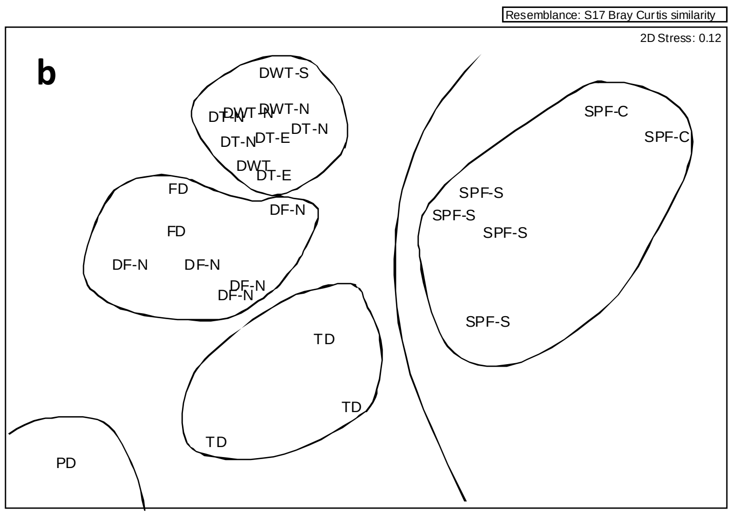


Figure 4.1.9. MDS analysis of plant communities at Duynefontein showing separation at plot no (a), community (b) and substrate (c).

Community descriptions in Table 4.1.3 and the text. PD = primary dunes; FD = foredunes; TD transverse dunes; DT = dune thicket; DWT = dwarf dune thicket; DF = dune fynbos; SPF = sand plain fynbos; S = south= E = east; W = west; N = north; C = central

Amphibolia laevis kusduinevygie, a coastal dune endemic

Pelargonium capitatum rose-scented pelargonium

Didelta carnosa subsp. *tomentosa* seegousblom, a coastal dune endemic

Ruschia macowanii bosvygie, also typical of openings in dune thicket

Lessertia frutescens kankerbos, a medicinal plant

Senecio elegans wild cineraria, an excellent pioneer of bare and mobile sand on the Cape coast

Plate 4.1.3. Plant species typical of the primary, foredune and transverse dune habitat at Duynefontein

Euphorbia mauritanica geelmelkbos in Community K8

Afrolimon peregrinum strandroos, an attractive shrub in dune openings and occasional thicket

Nemesia affinis weeskindertjie, a common spring annual in open patches

Hermannia pinnata kwasblaarkruippoproos, common in dune fynbos

Tetragonia fruticosa kinkelbossie, a common straggler and good pioneer in dune thicket

Olea exasperata slanghout, locally abundant at Duynefontein and one of the more common dune thicket species

Plate 4.1.4. Plant species typical of dune thicket and dune fynbos at Duynefontein

The critically rare *Leucadendron levisanus* Cape Flats conebush, also local endemic

Leucospermum hypophyllocarpodendron subsp. *canaliculatum* slangbossie, coastal sands endemic

Nemesia strumosa – lower West Coast sand endemic and Red Data species

Polycarena capensis geelopslag, West Coast endemic and Red Data species

Watsonia meriana rooikanol in damp sand plain fynbos

Plate 4.1.5. Plant species occurring in sand plain fynbos at Duynefontein

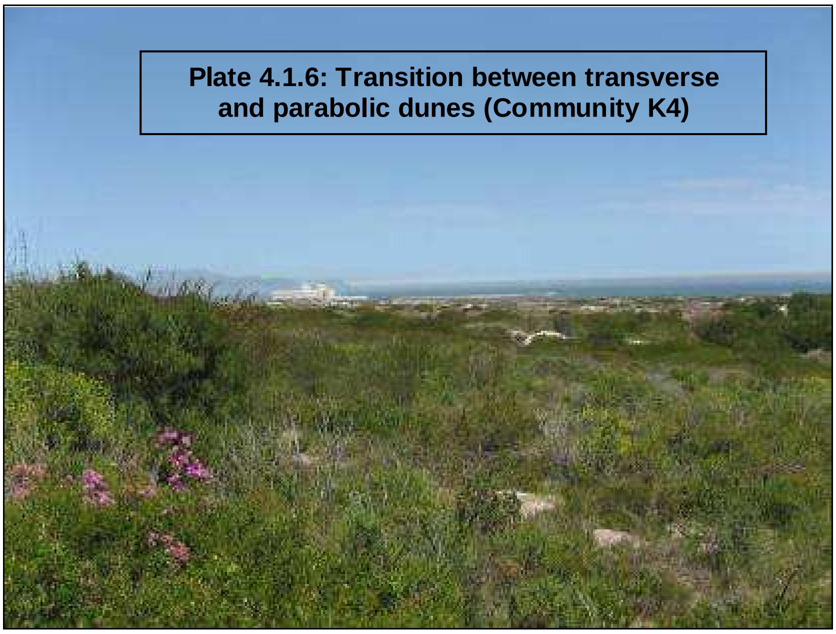


Plate 4.1.6: Transition between transverse and parabolic dunes (Community K4)

Stable parabolic dunes (Communities K5, K6, K7 & K8) (Plates 4.1.7 to 4.1.10)

Synonyms: Boucher (1987) - Euclea racemosa–Ischyrolepis eleocharis *community; Heijnis et al. (1999) – West Coast Dune Thicket; Low (2000) – Dune Thicket on calcareous sand/ Dune Thicket on limestone; Mucina & Rutherford (2006) – Cape Flats Dune Strandveld*

These communities represent the climax or mature stage of dune thicket occurring on the West Coast. It can form dense thicket of 3 m and taller, with decreasing height as one moves northwards from Cape Town towards Lambert's Bay. Structurally there is not too much to separate these communities, other than height, with dwarf (K5 & K6) and tall thicket (K7 & K8).

At Duynefontein the area covered by each community is 165.5 (K5), 106.3 (K6), 558.8 (K7) and 166.4 (K8) ha respectively, giving a total of 997.0 ha or 35% of the total site (Table 4.1.3)

The thicket community is dominated by broad-leaved shrubs including *Euclea racemosa* seeghwarrie, the semi parasite *Osyris compressa* Cape sumach, *Olea exasperata* slanghout, *Pterocelastrus tricuspidatus* kershout, *Putterlickia pyracantha* basterpendoring, *Rhus crenata* duinekraaibessie, *Rhus glauca* bloukoeniebos, *Rhus lucida* blinktaaibos and *Salvia africana-lutea* bruinsalie. *Helichrysum dasyanthum, Helichrysum revolutum* vaalsewejaartjie, *Pelargonium gibbosum* dikbeenmalva*, Solanum africanum* melkellie and *Tetragonia fruticosa* kinkelbossie, all subwoody shrubs, are locally found straggling through the canopy.

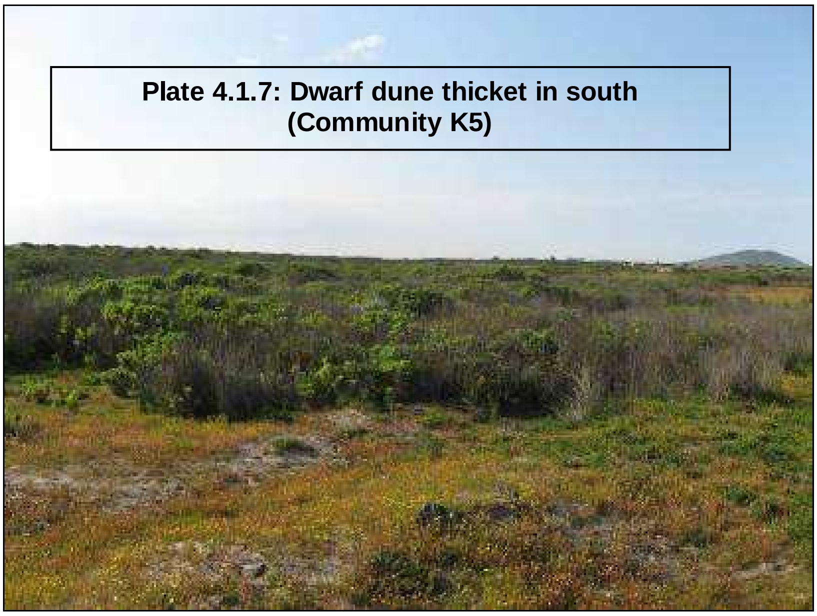


Plate 4.1.7: Dwarf dune thicket in south (Community K5)

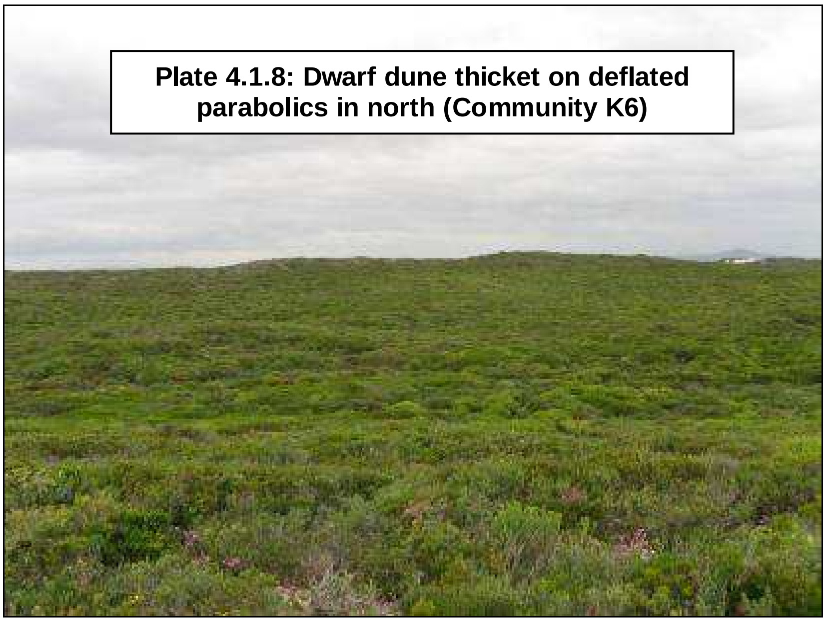


Plate 4.1.8: Dwarf dune thicket on deflated parabolics in north (Community K6)

Climbers are invariably present and include *Cissampelos capense* fynblaarklimop, *Cynanchum africanum* bobbejaantou, *Kedrostis nana* ystervarkpatats, as well as *Asparagus aethiopicus* haakdoring. Succulence is also locally prominent with species including *Cotyledon orbiculata* varkoor, *Euphorbia burmannii* steenbokmelkbos and *Euphorbia mauritanica* geelmelkbos. The understorey is often colonised by the perennial herb *Cineraria geifolia* cineraria, and several shade-tolerant annuals such as *Didymodoxa capensis* and *Torilis arvensis,* as well as a number of grasses including *Ehrharta brevifolia* var. *brevifolia* and *Ehrharta calycina* rooigras.

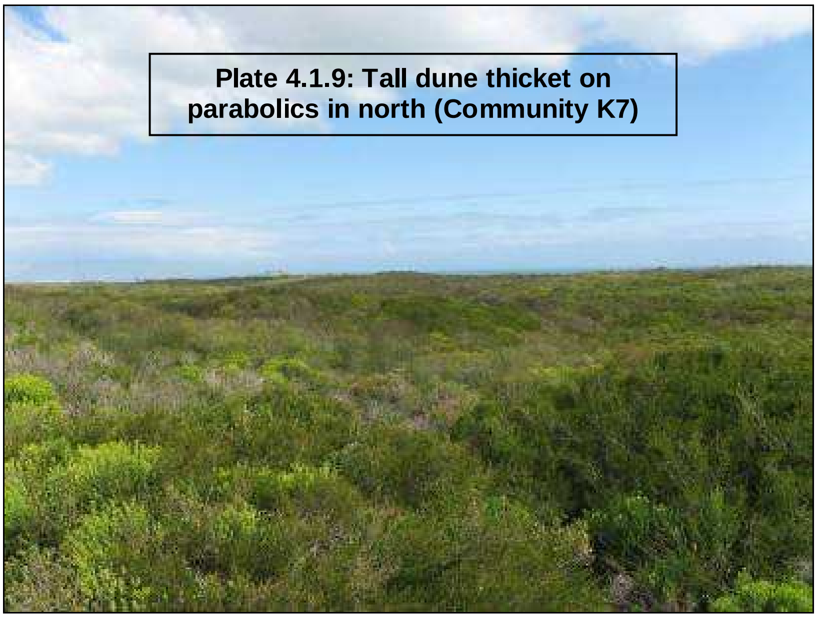


Plate 4.1.9: Tall dune thicket on parabolics in north (Community K7)

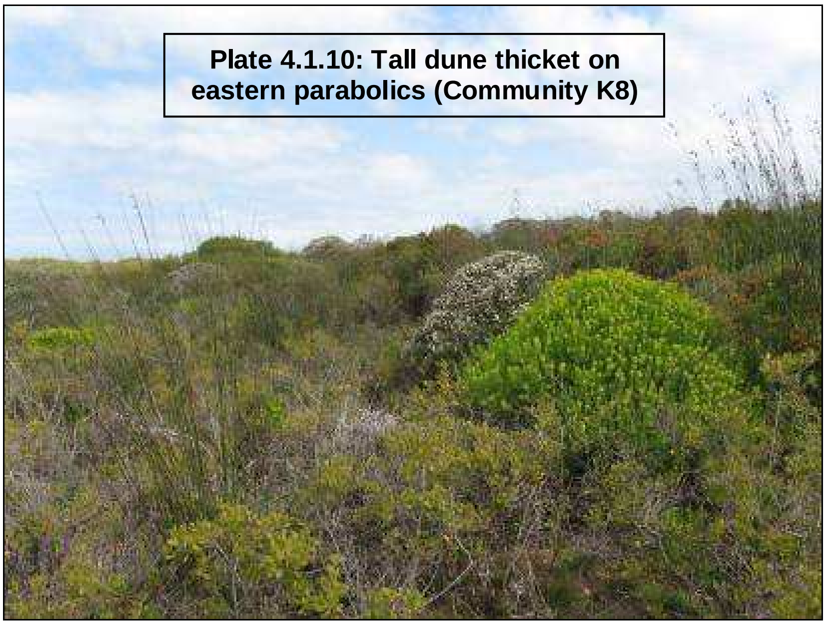


Plate 4.1.10: Tall dune thicket on eastern parabolics (Community K8)

Openings and slacks (valleys) in the dunes lend themselves to supporting a fragmented dune fynbos community which is successional to thicket. A very different species assemblage is found here, with a lower cover and height. Typical species are *Afrolimon peregrinum* strandroos, *Anthospermum prostratum, Chrysanthemoides monilifera* bietou, *Cineraria geifolia* cineraria, *Helichrysum* *niveum, Hermannia pinnata* kwasblaarkruippoproos, *Jordaaniella dubia* helderkruipvygie, *Nylandtia spinosa* skilpadbessie, *Othonna coronopifolia* sandbobbejaankool, *Ruschia macowanii* bosvygie, *Thesium spicatum* lidjes'tee and *Roepera flexuosa* spekbossie.

It is in these open parts that the mass displays of spring annuals are to be found on the West Coast, and these include *Cotula turbinata* ganskos, *Crassula glomerata* brakvygie, *Dimorphotheca pluvialis* witbotterblom, *Dischisma ciliatum, Heliophila coronopifolia* blouflaks, *Hemimeris racemosa* geelgesiggie, *Nemesia affinis* weeskindertjie, *Senecio arenarius* hongerblom, *Senecio littoreus* geelhongerblom and *Zaluzianskya villosa* drumsticks.

The graminoid (grass-like) component includes *Ficinia indica* knoppiesbiesie, *Ischyrolepis eleocharis* katstertriet, *Isolepis antarctica, Ehrharta calycina* rooigras, *Ehrharta villosa* pypgras and *Pentaschistis pallida.* Locally, the tall thatching reed, *Thamnochortus spicigerus,* can become dominant.

Geophytes (bulbs) tend to be found in more open terrain, although *Zantedeschia aethiopica* arum lily can be found in both broad habitats. Other species include *Albuca flaccida* geldbeursie, *Brunsvigia orientalis* koningskandelaar, *Gladiolus cunonius* rooipypie, *Haemanthus coccineus*, *Lachenalia rubida* sandviooltjie and *Trachyandra ciliata* wildeblomkool.

Of the thicket communities, species numbers are lowest (69) in dwarf thicket (K5) (Table 4.1.3).

Calcrete and limestone (Community K9) (Plate 4.1.12)

Synonyms were not identified as this does not form an extensive community.

This community is fragmented and occupies such small areas that it is not possible to map at this scale. However, it possesses a distinct flora with key species including *Rhus* spp. taaibos, *Asparagus* spp. haakdoring, *Euclea racemosa* seeghwarrie, *Ischyrolepis eleocharis* katstertriet, *and Roepera flexuosa* spekbossie. This substrate is rarely exposed on the site, invariably in the central parabolic dunes, but also along the coast. Here the predominant flora is pioneering species such as those outlined above under K1 and K2.

Plate 4.1.11: Limestone outcrop in north of site (Community K9)

(ii) Vegetation of neutral to acid sands

Sand plain fynbos (Community K10) (Plate 4.1.13)

Synonyms: Boucher (1987) – generally allied with his Phylica cephalantha *community, in association with* Cliffortia falcata *and* Thamnochortus obtusus*; Heijnis et al. – Proteoid Lowland Sand Plain Fynbos/ Lowland sand Plain Fynbos/ West Coast Dune Thicket-Lowland Fynbos transitional veld; Low (2000) – Sand Plain Fynbos on marine-derived acid sand/ Dune Thicket-Sand Plain Fynbos transition; Mucina & Rutherford (2006) – Atlantis Sand Fynbos*

This plant community is confined to the south-eastern flats of the site and is found on older deflated dunes which have lost much if not most of their calcium. The vegetation is fynbos dominated by restios and ericoid-leaved species, with the occasional protea, unlike the dune fynbos of the parabolic and transverse dunes where these groups are largely absent. Plant cover is moderate with heights rarely exceeding 1 to 2 m. Species prominent in this community include *Adenogramma glomerata* muggiegras, *Afrolimon purpuratum,* papierblom*, Dorotheanthus bellidiformis* subsp. *bellidiformis* Bokbaai vygie*, Diosma hirsuta,* rooiboegoe, *Erica mammosa,* rooiklossieheide*, Ficinia indica* knoppiesbiesie, *Grielum grandiflorum* platdoring*, Leucadendron levisanus* Cape Flats conebush, *Metalasia muricata* blombos, *Nemesia strumosa* balsamienie*, Passerina corymbosa* sandgonnabas*, Plecostachys serpyllifolia* vaaltee, *Polycarena capensis* geelopslag, *Rhus laevigata* duinetaaibos, *Senecio halimifolius* tabakbos, *Senecio hastatus* groundsel, *Serruria decipiens* Weskusspinnekopbos*, Thamnochortus erectus* wyfieriet and *T.obtusus.*

This community forms a significant part of the whole Duynefontein site, with 624.3 ha and 22.4% (Table 4.1.3).

Table 4.1.3. Plant communities occurring at Duynefontein (refer to Figure 4.1.7), together with summary of species data						
Plant community	**Description**	**Flora sample**	**Vegetation (plot) sample**	**Total plant species (Red Data – see Table 4.1.8)**	**Area (ha)**	**%**
Calcareous sands and limestones						
K1	Primary dunes on coast	Yes	No	24 (3)	37.4	1.3
K2	Mobile and semi-mobile sparsely vegetated foredunes (mapped together with primary dunes (K1, above))	Yes	Yes	46 (0)	(incl. In K1)	Incl. in K1
K3	Moderate height dune thicket and dune fynbos on mobile to semi-mobile transverse dunes: sparsely to non-vegetated (K1A); vegetated (K1B)	Yes	Yes	51 (4)	808.6	28.9
K4	Transition between transverse and parabolic dunes	No	No	N/A	113.3	4.1
K5	Dwarf dune thicket and dune fynbos of low parabolic dunes in the south	Yes	Yes	69 (3)	165.5	5.9
K6	Dwarf dune thicket (K6A) and dune fynbos (K6B) of deflated parabolic dunes in the north	Yes	Yes	70 (1)	106.3	3.8
K7	Moderate height to tall dune thicket (crests – D7A) and dune fynbos (slacks and openings – D7B) on high parabolic dunes	Yes	Yes	108 (4)	558.8	20.0
K8	Tall dune thicket of deflated parabolic dunes in east	Yes	Yes	86 (4)	166.4	6.0
K9	Short fynbos and thicket of calcretes and limestones (too diffuse to map)	Yes	No	42 (0)	N/A	N/A
Neutral to acid sands						
K10	Sand plain fynbos on neutral to acid sandy flats (includes dryland and wetland samples, the latter not mapped)	Yes	Yes	124 (15)	624.3	22.4
Wetlands						
K11	Alkaline wetland in dune slack	Yes	Yes	31 (2)	3.7	0.1
Developed	Developed areas	N/A	N/A	N/A	209.7	7.5
Total					**2 791.9**	**100.0**

(iii) Wetland

Dune slack wetland in south (Community K11)

Synonyms: Boucher (1987) – Sarcocornia pillansii-Limonium-Ficinia nodosa *(*Scirpus nodosus*) community and related associations; Mucina & Rutherford (2006) – possibly related to Cape Lowland Freshwater Wetlands*

This system is being addressed in greater detail by the Fresh Water Consulting Group. Suffice to say, one wetland in the south was sampled. This has a relatively low species complement with typical taxa including *Ficinia nodosa* steekbiesie, *Nidorella foetida* vleikruid, *Plecostachys serpyllifolia* vaaltee, *Sarcocornia pillansii* brakbos and *Senecio halimifolius* tabakbos.

As the total area (3.7 ha, 0.1% -Table 4.1.3) for the whole site suggests, wetlands are poorly represented on the site.

Plate 4.1.13: Wetland in dune slack in south of site (Community K11)

c Floristic analysis

(i) Local floristic analysis

MDS analysis of local floras at Duynefontein (Figure 4.1.10) echoes the vegetation relationships found in Section (b), above, with a transition from mobile sands to more stable substrates inland. The floras of both calcareous and neutral to acid sand habitats are well separated, as are those of primary dunes and mature vegetation of stable dunes.

(ii) Subregional floristic analysis

Figure 4.1.11 shows a MDS analysis of primary and stable dune floras occurring between the Cape Flats and upper Cape West Coast (Lambert's Bay). There is a clear trend in species turnover as one moves northwards up the West Coast (for both primary and stable dune floras), with a decline in similarity with distance (Table 4.1.4). Duynefontein's primary dune floras are quite distinctive, although those of the stable dunes are closely associated with other stable dune floras for the lower West Coast.

However, species similarity is not particularly high, suggesting high species turnovers over relatively short distances. For example there is a 45.9% similarity with the Melkbosstrand dunes only 10 km to the south, and 37.7% for Tygerfontein, some 40 km north.

For neutral to acid sand plain fynbos, again high species turnovers are evident between Duynefontein and adjacent areas (Table 4.1.5), for example Melkbosstrand (5 km, 42.0 % similarity; Buffelsrivier: 15 km, 35.4%; Milnerton Race Course: 25 km, 28.7%). There is a fairly good negative linear correlation (R^2 = 0.720) for SPF floras and their similarity with Duynefontein.

Table 4.1.4. Flora similarity percentages and distance from Duynefontein: calcareous substrate floras

Locality	**Distance (km)**	**Similarity (%)**
Blaauwberg Conservation area	10	50.4
Melkbosstrand	10	45.9
Cape Flats Nature Reserve	35	47.4
Westbank	40	48.9
Driftsands Nature Reserve	45	42.6
Mitchells Plain	45	40.9
Pelican Park-Zeekoeivlei Flats	45	34.9
Mitchells Plain-Khayelitsha Flats	50	46.8
Wolfgat Nature Reserve	50	45.4

(iii) Endemism

Assessment of the plant species for endemicity at Duynefontein is shown in Table 4.1.6, based upon a summary of species distributions for the Duynefontein flora (Appendix 4.1.3). Of the 21 endemics occurring at Duynefontein, seven are combined local and habitat, one local, 11 regional and habitat, and two regional only. The sand plain fynbos has the highest number (10) of any particular community.

Table 4.1.5. Flora similarity percentages and distance from Duynefontein: sand plain fynbos (only sites at or near the coast)

Locality	Distance (km)	Similarity (%)
Blaauwberg Conservation Area	10	33.7
Brakkefontein	10	35.4
Buffelsrivier	15	40.0
Melkbosstrand	5	42.0
Milnerton Race Course	25	28.7
Potsdam	15	40.6
Slangkop	55	22.1
Wildevoelvlei	50	28.7

Table 4.1.6. Assessment of endemism at Duynefontein

Community (see Figure 4.1.7)	Community description	Species number: Local and habitat endemics	Local endemics	Regional and habitat endemics	Regional endemics	**Total endemics**
Calcareous sands and limestones						
K1	Primary dunes on coast	1	0	1	0	2
K2	Mobile and semi-mobile sparsely vegetated foredunes (mapped together with primary dunes (K1, above)	0	0	0	0	0
K3	Moderate height dune thicket and dune fynbos on mobile to semi-mobile transverse dunes: sparsely to non-vegetated (K1A); vegetated (K1B)	1	0	2	0	3
K4	Transition between transverse and parabolic dunes	0	0	0	0	0
K5	Dwarf dune thicket and dune fynbos of low parabolic dunes in the south	1	0	0	0	1
K6	Dwarf dune thicket and dune fynbos of deflated parabolic dunes in the north	1	0	0	0	1
K7	Moderate height to tall dune thicket (crests – D7D) and dune fynbos (slacks and openings – D7F) on high parabolic dunes	1	0	2	0	3
K8	Tall dune thicket of deflated parabolic dunes in east	1	0	3	0	4
K9	Short fynbos and thicket vegetation of calcretes and limestones (too diffuse to mapped)	0	0	1	0	1
Neutral to acid sands						
K10	Sand plain fynbos on neutral to acid sandy flats (includes dryland and wetland samples, the latter not mapped)	4	1	3	2	10
Wetlands						
K11	Brack wetland in dune slack	0	0	0	0	0
Total		**7**	**1**	**11**	**2**	**21**

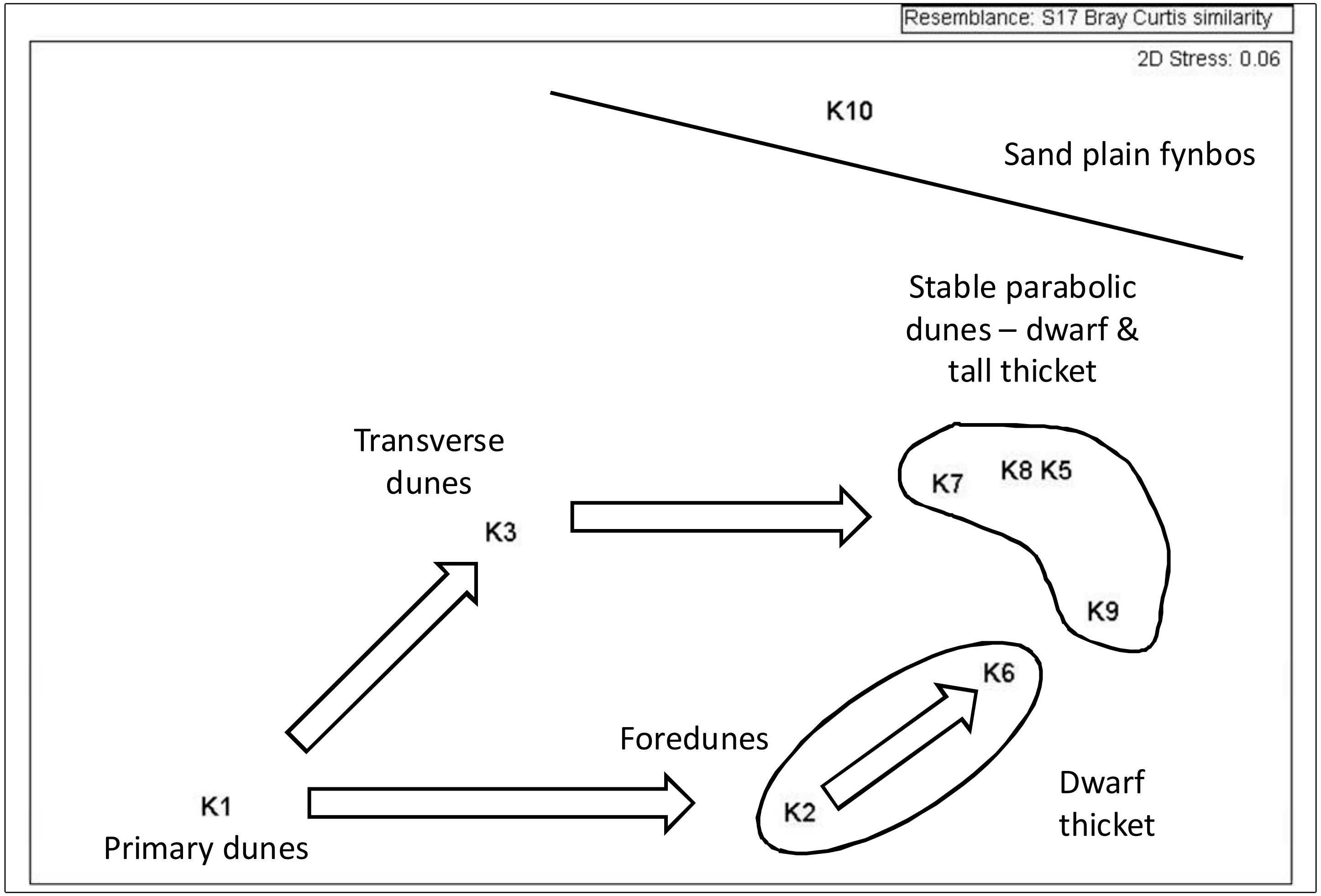


Figure 4.1.10. Floristic MDS analysis at Duynefontein. The successional relationship between pioneering dune floras (left) and climax (mature) dune thicket (right) is clearly apparent, as is the distinct separation of dune (calcareous) and sand plain (neutral to acid sands) habitats. Separation at 20% (DT-SPF) and 40% (FD-DT). For explanation of plant community numbers see Table 4.1.6

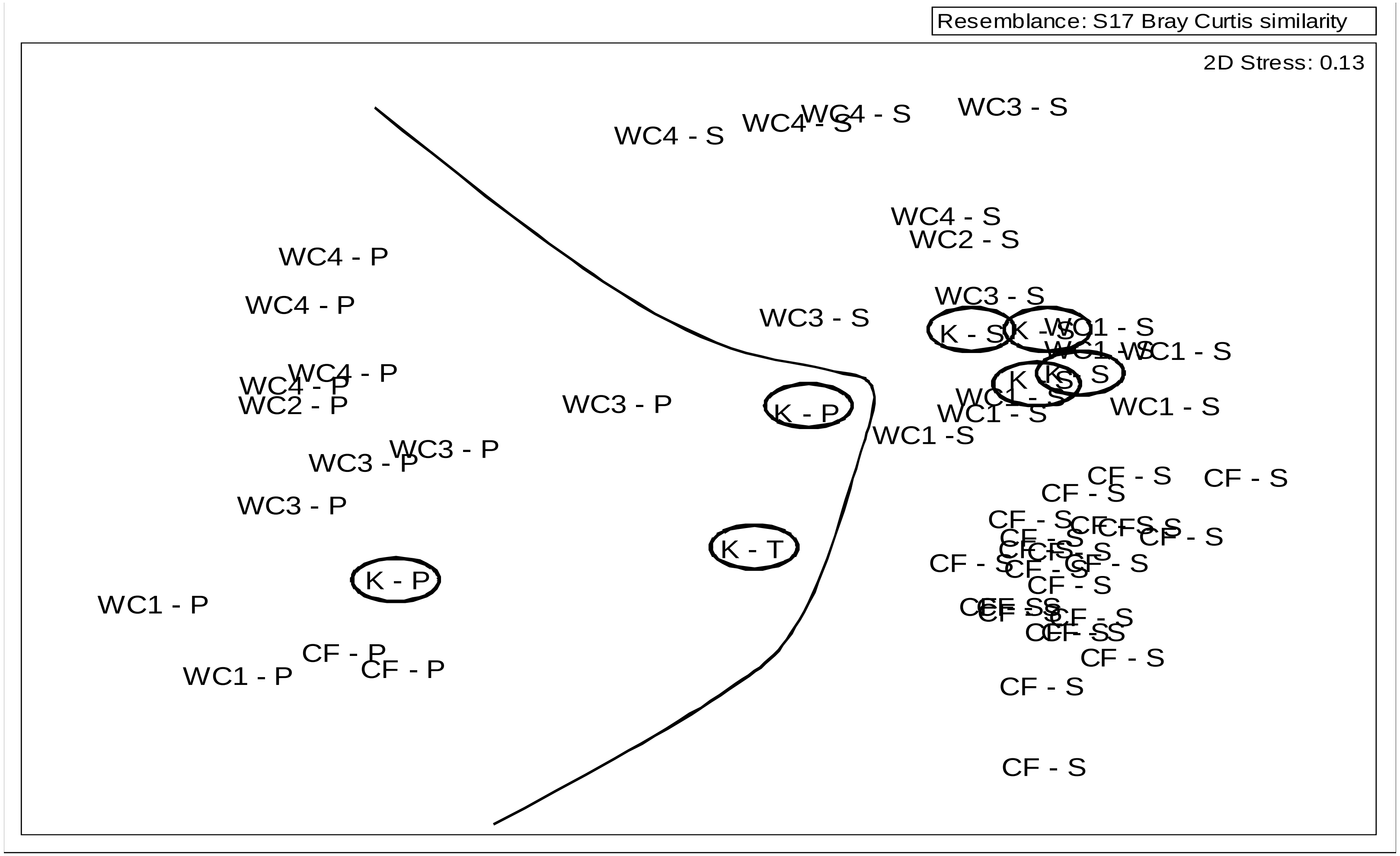


Figure 4.1.11. MDS analysis of primary (-P), transverse (-T) and stable dune thicket floras (-S) at Duynefontein (K) and on the Cape Flats (C), and lower (Milnerton to Bokbaai) (WC1), middle (Bokbaai to Saldanha Peninsula)(WC2), Saldanha Peninsula (WC3) and upper Cape West Coast (Saldanha Peninsula to Elandsbaai) (WC4). There is clear distinction between primary and stable dunes, as there is a general separation of subregional coastal calcareous floras, with a gradual species turnover from the Cape Flats to Elandsbaai as one moves northwards along the West Coast. Duynefontein primary floras show some distinctiveness although stable dune floras are associated with the lower West Coast (WC1)

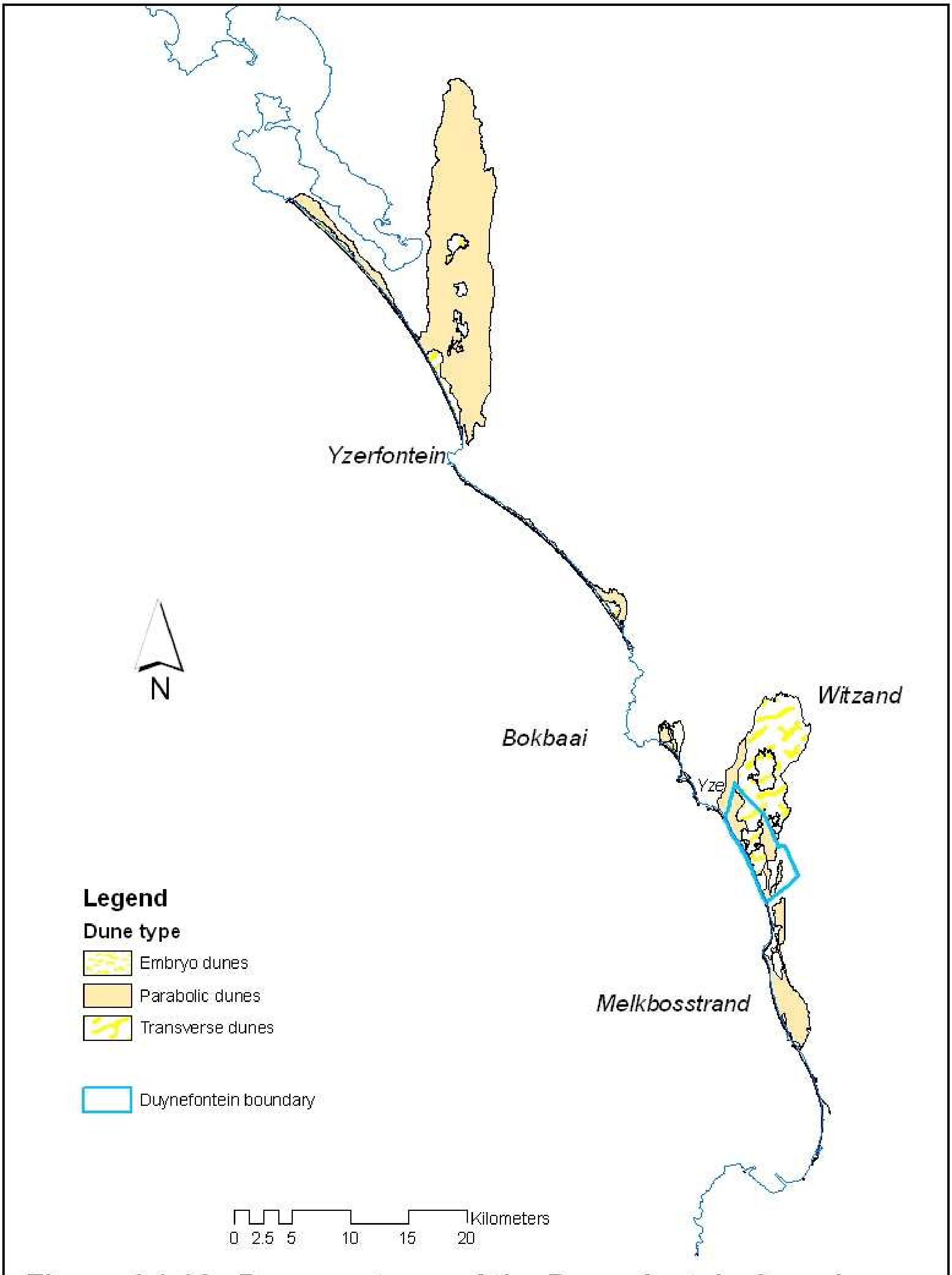


Figure 4.1.12. Dune systems of the Duynefontein & environs coastline. Note the prominence of the two transverse dunefields, one between Duynefontein and Witzand, and the other north of Yzerfontein

Figure 4.1.13. Aerial photograph mosaic of the Duynefontein site, showing prominence of the transverse dune system (arrowed)

4.1.3 Rarity and sensitivity analysis

a Rarity

Rarity for the site is shown in Figure 4.1.14, where vegetation type, habitat, and Red Data species (unweighted and weighted) are assessed, based upon criteria and scores in Appendix 4.1.4. Vegetation type rarity is high, with both major vegetation types (Cape Flats Dune Strandveld and Atlantis Sand Fynbos) being Endangered (Rouget *et al*., 2004). However, habitat rarity provides a far more reliable assessment of ecosystem rarity at point scale: much of the site has a high to very high rarity (Figure 4.1.14), particularly in the south-eastern flats which support sand plain fynbos. The transverse dunes also rate as high.

Species rarity (unweighted and weighted) is extremely low for most of the site, except for the sand plain fynbos, with a total for Duynefontein of 32 (8.6%) on the Red Data list (Table 4.1.8). Highest numbers are found in sand plain fynbos. Overall rarity (Figure 4.1.15), which presents a total, weighted value for rarity across the site (see Appendix 4.1.4), indicates highest rarity for the sand plain fynbos, transverse dunes and southern dwarf dune thicket, with the rest of site rating as medium rarity (Figure 4.1.15).

b Sensitivity

Four criteria were selected for sensitivity: erosion potential, susceptibility to drought, proneness to fire and resilience (the ability of a community to recover from disturbance). These are shown in Figure 4.1.16, and combined in Figure 4.1.17 (calculated from Appendix 4.1.4). These criteria, whilst perhaps not as significant as rarity for guiding location of development nodes at Duynefontein, nevertheless are important informants for management and conservation on the site, particularly with a view to regulation and management during construction. Fire is also a critical consideration, given that the fire proneness for much of the site is very high. If development is allowed to proceed, then fire management will be a crucial aspect of the EMP, as will the erosion susceptibility of the coastal dunes. Combined values for the site (Figure 4.1.17) indicate the transverse dunes and the sand plain fynbos in the south-east to possess high sensitivity, with the wetland in the south been accorded very high sensitivity.

Table 4.1.8. Red Data species occurring at Duynefontein (from Raimondo et al, 2009)

Family	Species	Present Red Data status	Site Description	Plant community (see Table 4.1.7)
Division: Anthophyta	**Class**: Dicotyledones			
APIACEAE	*Capnophyllum africanum*	NT	Dwarf thicket and fynbos of low parabolic dunes in the south	K5
ASTERACEAE	*Cotula duckittiae*	VU	Dwarf thicket and fynbos of low parabolic dunes in the south Tall dune thicket of deflated parabolic dunes in east Sand plain fynbos on neutral to acid sandy flats	K5 K8 K10
ASTERACEAE	*Cotula filifolia*	CR	Alkaline wetland in dune slack	K11
ASTERACEAE	*Helichrysum cochleariforme*	NT	Dune thicket and dune fynbos on mobile to semi-mobile transverse dunes	K3
ASTERACEAE	*Steirodiscus tagetes*	VU	Tall dune thicket of deflated parabolic dunes in east	K8
EUPHORBIACEAE	*Euphorbia caput-medusae* subsp. *marlothiana*	VU	Dune thicket and dune fynbos on high parabolic dunes Tall dune thicket of deflated parabolic dunes in east	K7 K8
FABACEAE	*Aspalathus ternata*	VU	Sand plain fynbos on neutral to acid sandy flats	K10
FABACEAE	*Psoralea repens*	NT	Primary dunes on coast Dune thicket and dune fynbos on mobile to semi-mobile transverse dunes Alkaline wetland in dune slack	K1 K3 K11

Table 4.1.8 (contd.)

MALVACEAE	*Hermannia procumbens subsp. procumbens*	CR	Sand plain fynbos on neutral to acid sandy flats	K10
MESEMBRYANTHEMACEAE	*Lampranthus explanatus*	EN	Sand plain fynbos on neutral to acid sandy flats	K10
MESEMBRYANTHEMACEAE	*Ruschia indecora*	EN	Primary dunes on coast Dune thicket and dune fynbos on mobile to semi-mobile transverse dunes Dune thicket and dune fynbos on high parabolic dunes Sand plain fynbos on neutral to acid sandy flats	K1 K3 K7 K10
PLUMBAGINACEAE	*Afrolimon purpuratum*	CR	Sand plain fynbos on neutral to acid sandy flats	K10
PROTEACEAE	*Leucadendron levisanus*	CR	Sand plain fynbos on neutral to acid sandy flats	K10
PROTEACEAE	*Leucospermum hypophyllocarpodendron subsp. canaliculatum*	VU	Sand plain fynbos on neutral to acid sandy flats	K10
PROTEACEAE	*Serruria decipiens*	VU	Sand plain fynbos on neutral to acid sandy flats	K10
RUTACEAE	*Diosma aspalathoides*	NT	Sand plain fynbos on neutral to acid sandy flats	K10
RUTACEAE	*Diosma dichotoma*	VU	Sand plain fynbos on neutral to acid sandy flats	K10
SCROPHULARIACEAE	*Nemesia strumosa*	NT	Sand plain fynbos on neutral to acid sandy flats	K10
SCROPHULARIACEAE	*Polycarena capensis*	NT	Sand plain fynbos on neutral to acid sandy flats	K10
THYMELAEACEAE	*Passerina ericoides*	VU	Primary dunes on coast Dune thicket and dune fynbos on mobile to semi-mobile transverse dunes	K1 K3

Table 4.1.8 (contd.)

Division: Anthophyta	**Class**: Monocotyledones			
IRIDACEAE	*Babiana tubulosa* var. *tubulosa*	VU	Dwarf thicket and fynbos of low parabolic dunes in the south Dune thicket and dune fynbos of deflated parabolic dunes in north Dune thicket and dune fynbos on high parabolic dunes Sand plain fynbos on neutral to acid sandy flats	K5 K6 K7 K10
ORCHIDACEAE	*Disa draconis*	EN	Sand plain fynbos on neutral to acid sandy flats	K10
ORCHIDACEAE	*Satyrium carneum*	NT	Dune thicket and dune fynbos on high parabolic dunes Tall dune thicket of deflated parabolic dunes in east	K7 K8
Specific site locality unknown (from previous collections):				
FABACEAE	*Aspalathus albens*	VU		
MESEMBRYANTHEMACEAE	*Dorotheanthus apetalus*	VU		
PROTEACEAE	*Serruria fasciflora*	NT		
THYMELAEACEAE	*Lachnaea grandiflora*	VU		
THYMELAEACEAE	*Lachnaea uniflora*	VU		
APONOGETONACEAE	*Aponogeton angustifolius*	VU		
CYPERACEAE	*Ficinia pygmaea*	VU		
CYPERACEAE	*Isolepis venustula*	VU		
RESTIONACEAE	*Elegia recta*	NT		

NT: Near Threatened; R: Rare; VU: Vulnerable; EN: Endangered
Th: note this is a South African category and is not recognised internationally.

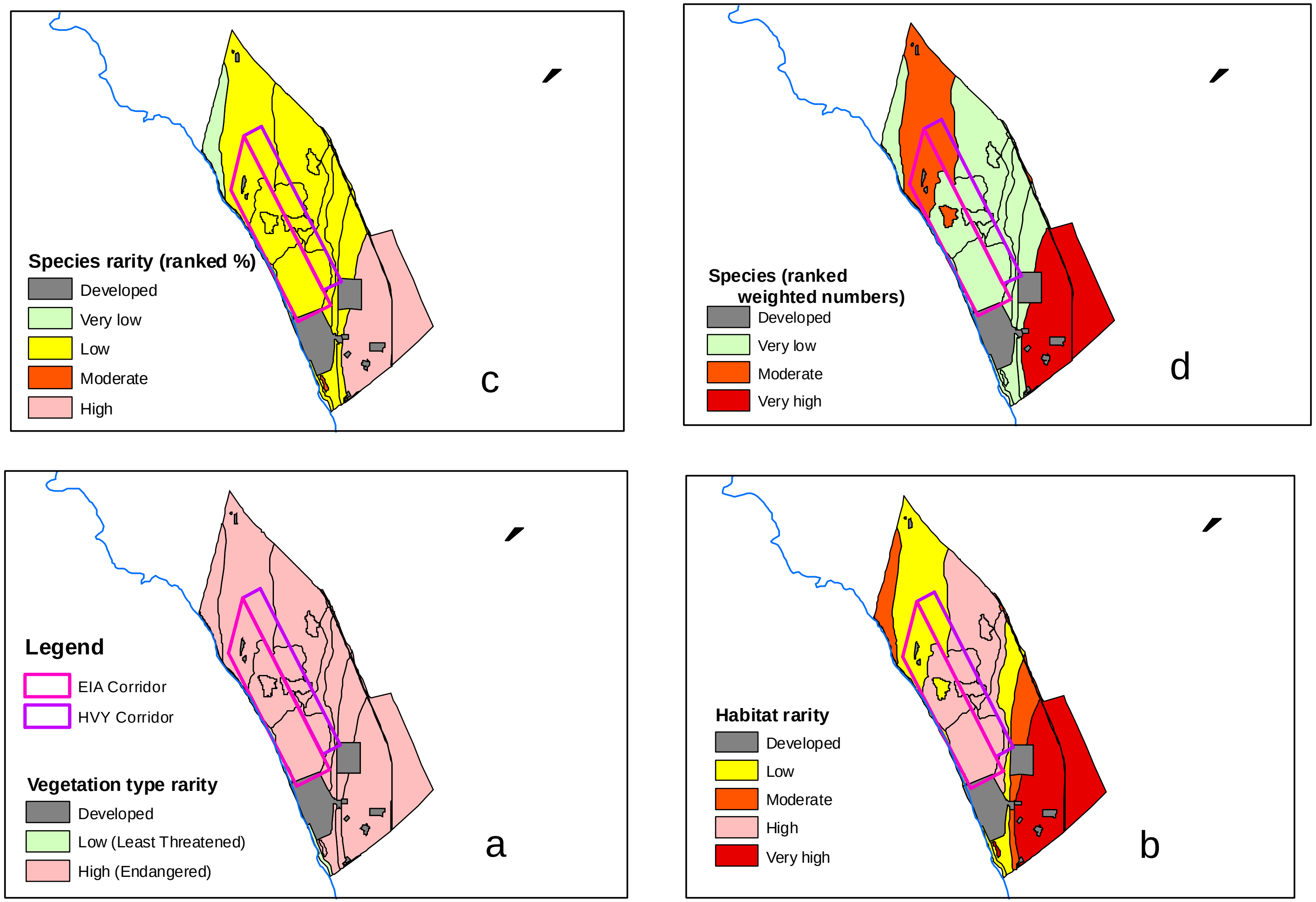


Figure 4.1.14. Rarity at Duynefontein, showing position of proposed nuclear power station footprints. a: vegetation type; b: habitat; c: species (%); d: species (weighted numbers). Rarity calculated from values in Appendix 4.1.4

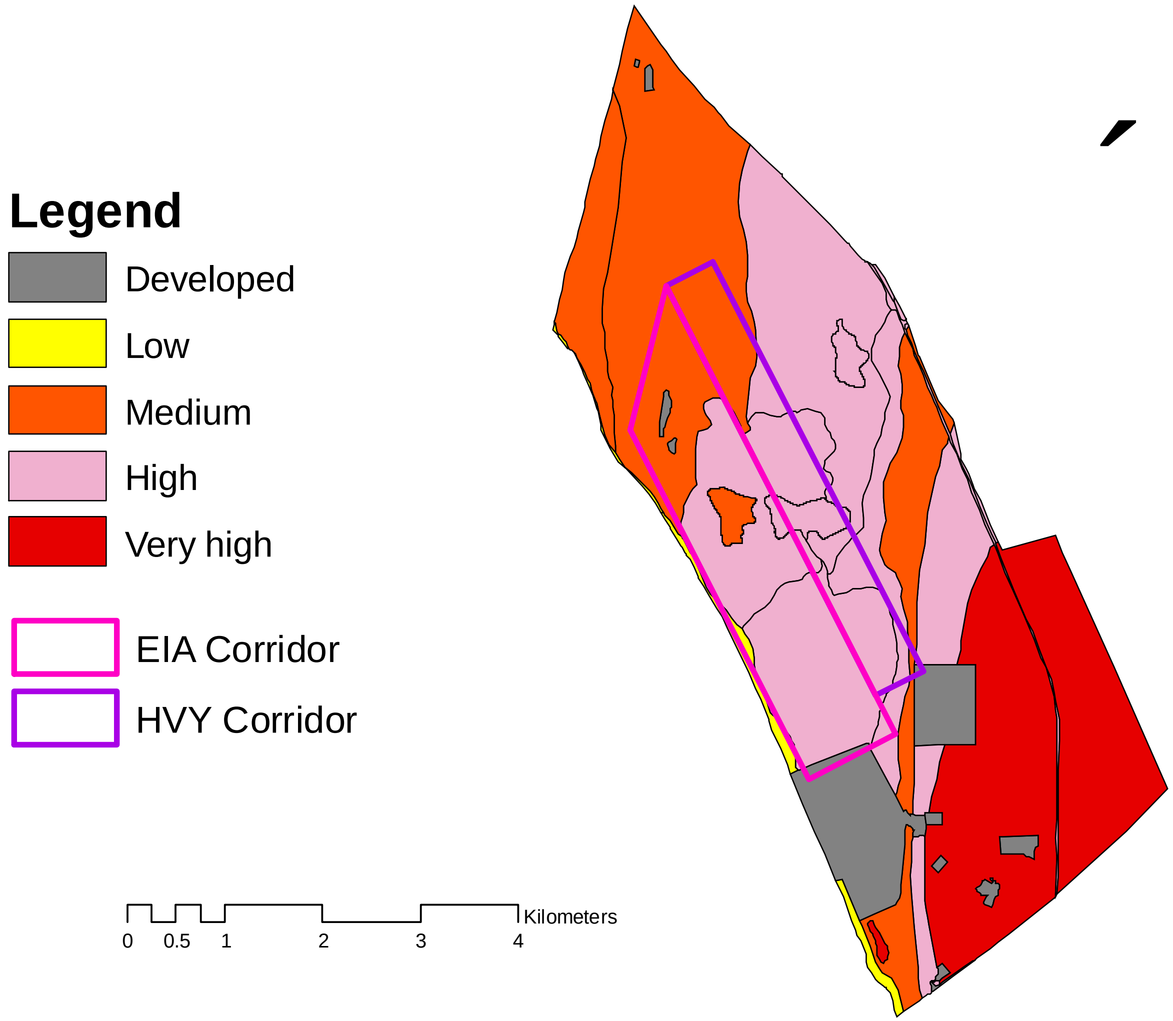


Figure 4.1.15. Overall rarity at Duynefontein, showing proposed nuclear power station footprints. Rarity calculated from values in Appendix 4.1.4

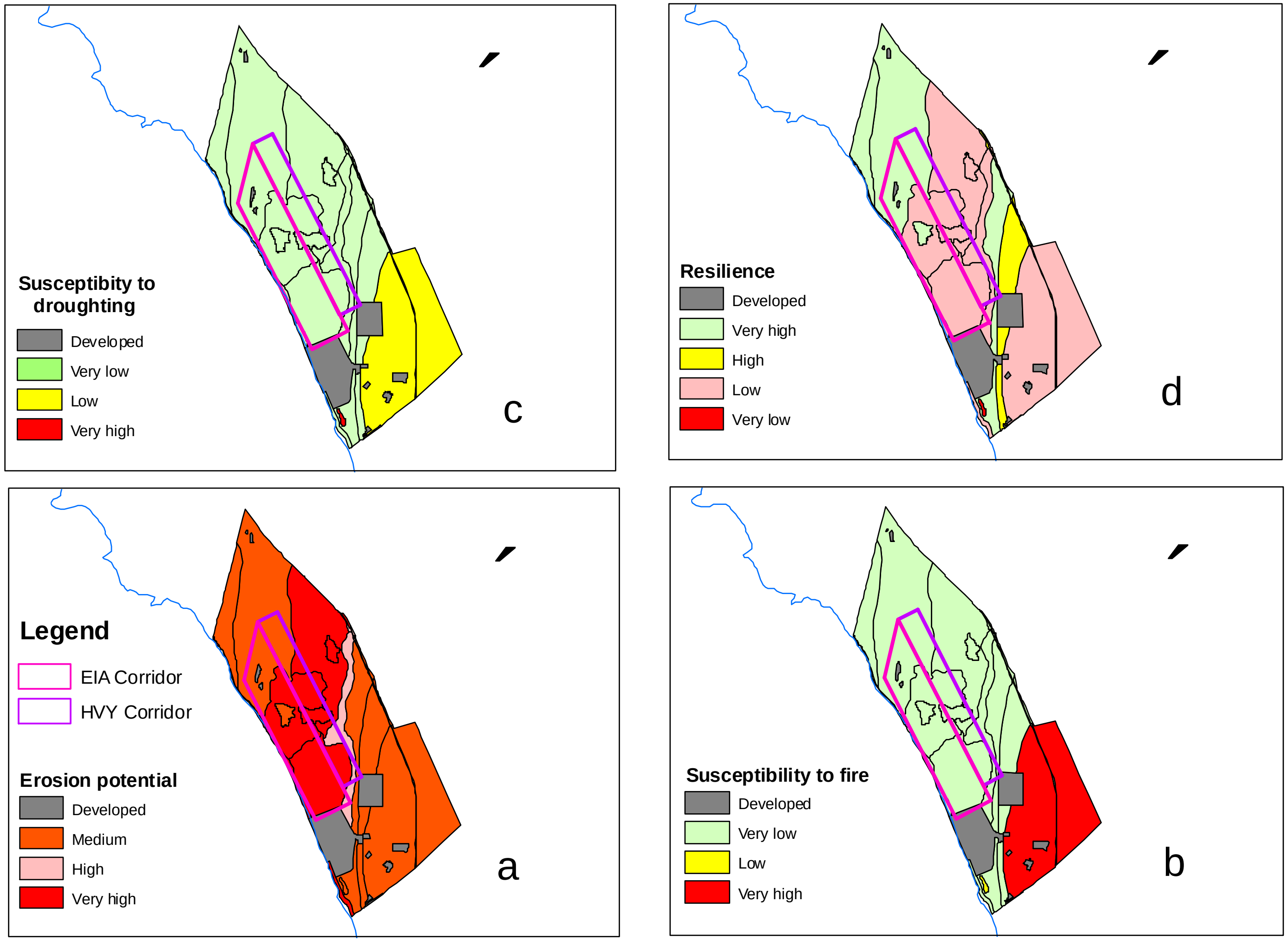


Figure 4.1.16. Ecological sensitivity at Duynefontein, showing proposed nuclear power station footprints. a: erosion potential; b: susceptibility to droughting; c: proneness to fire; d: plant community resilience. Sensitivity calculated from values in Appendix 4.1.4

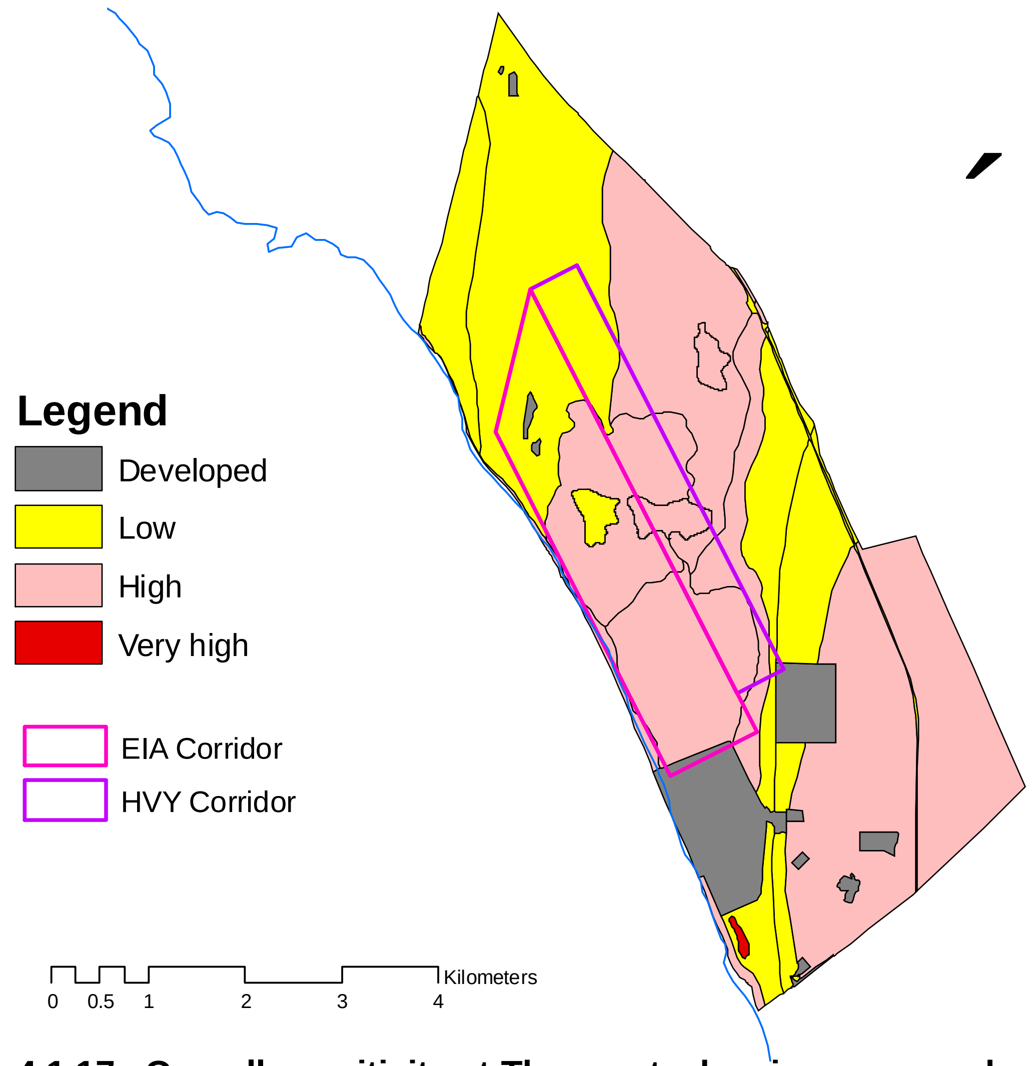


Figure 4.1.17. Overall sensitivity at Thyspunt, showing proposed nuclear power station footprints. Sensitivity calculated from values in Appendix 4.1.4

4.1.4 Conservation

Broader conservation assessments by Cowling *et al*. (1999) and Low (2003), rate the Duynefontein (Koeberg)-Witzand dune system highly (Figure 4.1.18). However, the adjacent flats rank much lower in Cowling *et al*. (1999) (0 - 20; 20 -40%), as opposed to Low's (2003) ranking of 40 - 60% (Figure 4.1.18). The Duynefontein site is a declared Private Nature Reserve and has an active management plan in place (Gert Greeff, pers.comm., September 2007). Both the Duynefontein site, as well as adjacent land on the West Coast, have been rated highly for conservation by Jarman (1986), Daines & Low (1993), and the City of Cape Town (Category A in the CCT Biodiversity Network - Pat Holmes, pers.comm., updated in 2009). Ironically, a conservation assessment aimed at establishing core conservation areas within the City failed to identify Koeberg as a key site (Maze & Rebelo, 1999), although they did accord priority status to several areas nearby. The upshot is that a number of studies consider the site a high priority for conservation, and that the protection status of the Koeberg Nature Reserve should be maintained.

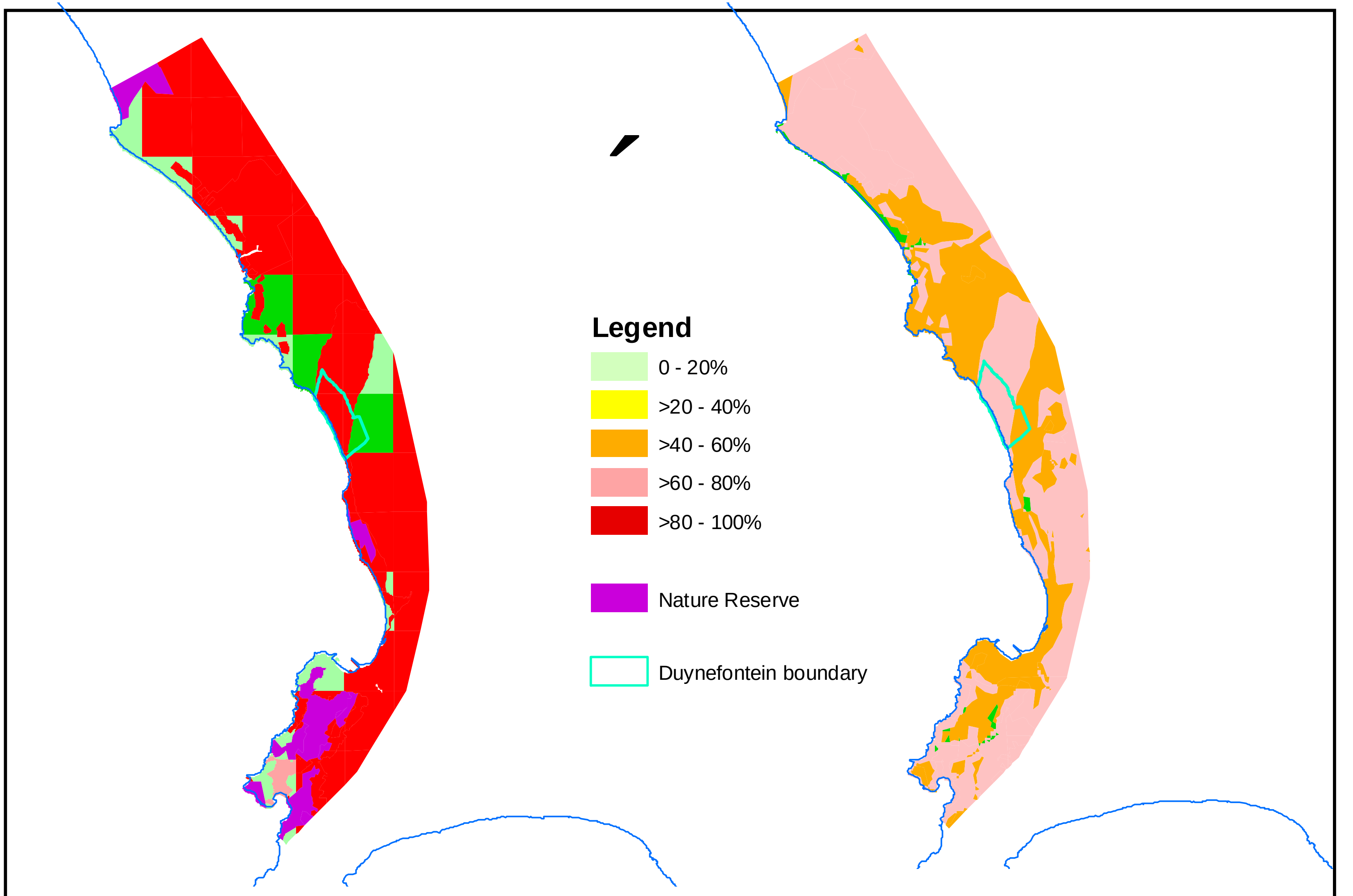


Figure 4.1.18. Irreplaceability (Cowling et al., 1999) (left) and ecological importance (Low, 2003) (right) for the Duynefontein & environs coastal area

4.2 Bantamsklip

4.2.1 Background and general description

Most of this site is underlain by unconsolidated aeolian calcareous Quaternary sediments (Strandveld and Waenhuiskrans Formations) at the coast (Gresse & Theron, 1997) (Figure 4.2.1). At places along the coast and further inland these sediments become partially consolidated to form calcrete lenses and these can be as thick as 170 m (Gresse & Theron, 1997). Certainly the site is backed by aeolianite to a height of over 200 m amsl, just to the west of the Hagelkraal River.

The site straddles two broad landforms: the Die Dam Land System (DLS) at the coast, with the Hagelkraal Land System reaching from here to about 3 km inland (Thwaites & Cowling, 1988). In the latter, calcified dunes have banked up against sandstone ridges (Cowling *et al*., 1988b), which give the topography this impressive height in an otherwise flat landscape. These in turn give rise to shallow alkaline calcareous soils. Deeper, more acidic, colluvial soils occur on the lower slopes below the ridges (Cowling *et al*., 1988b) and have distinctive E (eluviated) horizons indicating the early stages of podsolisation (Cowling *et al*., 1988b). The DLS largely comprises old and recent coastal sands forming a mosaic of artificially fixed and naturally mobile dunes (Cowling *et al*., 1988b). By contrast the coastal sands of this system are much younger and deeper, but also calcareous and alkaline. Where calcrete reaches the surface, soils are correspondingly shallower (Cowling *et al*., 1988b).

The central eastern boundary of the site intersects with quartzitic sandstones (*sensu* Gresse & Theron, 1997; Figure 4.2.1) of the Peninsula Formation and these will support acidic, sandy soils of varying depths. Along the Hagelkraal River, recent alluvial deposits are found locally, with light red sand in the upper part of the site, along with two small patches of Tertiary silcrete (Gresse & Theron, 1997; Figure 4.2.1) of the Grahamstown Formation, and which occur just outside the north-eastern boundary. On the lower slopes of the mountain ridges in the north of the area is found talus material. Rarer is the occurrence, on the site's north-eastern boundary, of a thin wedge of granite (Figure 4.2.1) belonging to the Hermanus Pluton.

Contributing significantly to the coastal landscape is the presence of dunes (*sensu* Low & Pond, 2006b). Within the general area these extend 7.2 km inland at the Walker Bay Nature Reserve between Hermanus and De Kelders, 4.4 km at Quoin Point and 7.3 km at Cape Agulhas, and about 2.6 km at Bantamsklip (Figure 4.2.2). This landscape is dominated chiefly by deflated parabolic dunes, but with a strong presence of transverse (incorrectly mapped as undulating dunefields in Low & Pond (2006b) and more recent parabolic dunes as well. Many of the transverse dunes have been artificially vegetated by *Acacia cyclops* rooikrans and other introduced woody aliens.

The Agulhas Plain is home to a rich assortment of different vegetation groups. Mucina & Rutherford (2006), by inference, record some 17 vegetation types, with nine occurring in the general study area (Figure 4.2.3). These are: Agulhas Limestone Fynbos (Least Threatened - LT), Agulhas Sand Fynbos (Vulnerable - V), Cape Lowland Freshwater Wetlands (V), Cape Seashore Vegetation (LT), Elim Ferricrete Fynbos (Endangered - E), Overberg Dune Strandveld (LT), Overberg Sandstone Fynbos (LT), Southern Coastal Forest (LT) and Western Coastal Shale Band Vegetation (LT).

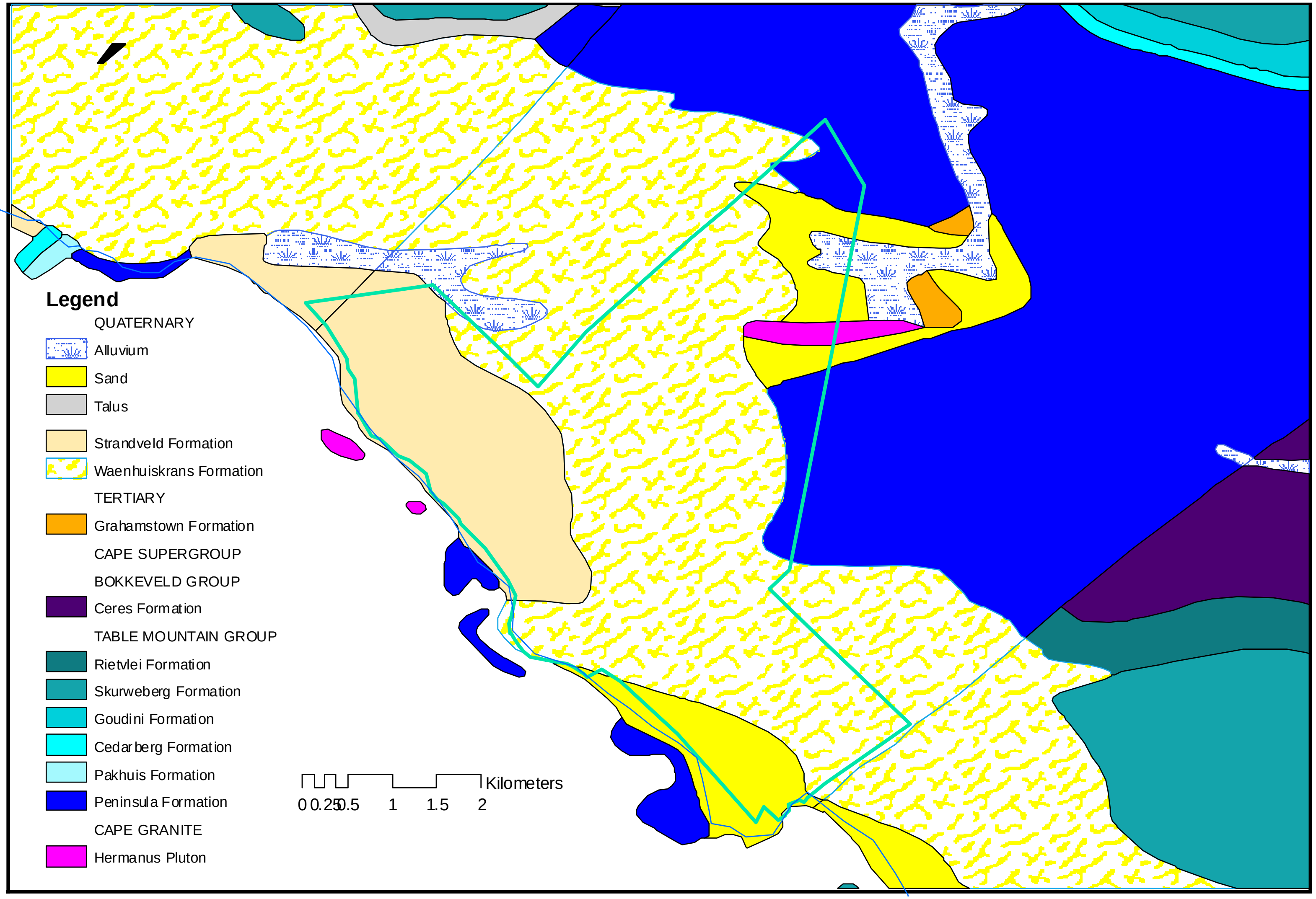


Figure 4.2.1. Geology of Bantamsklip & environs

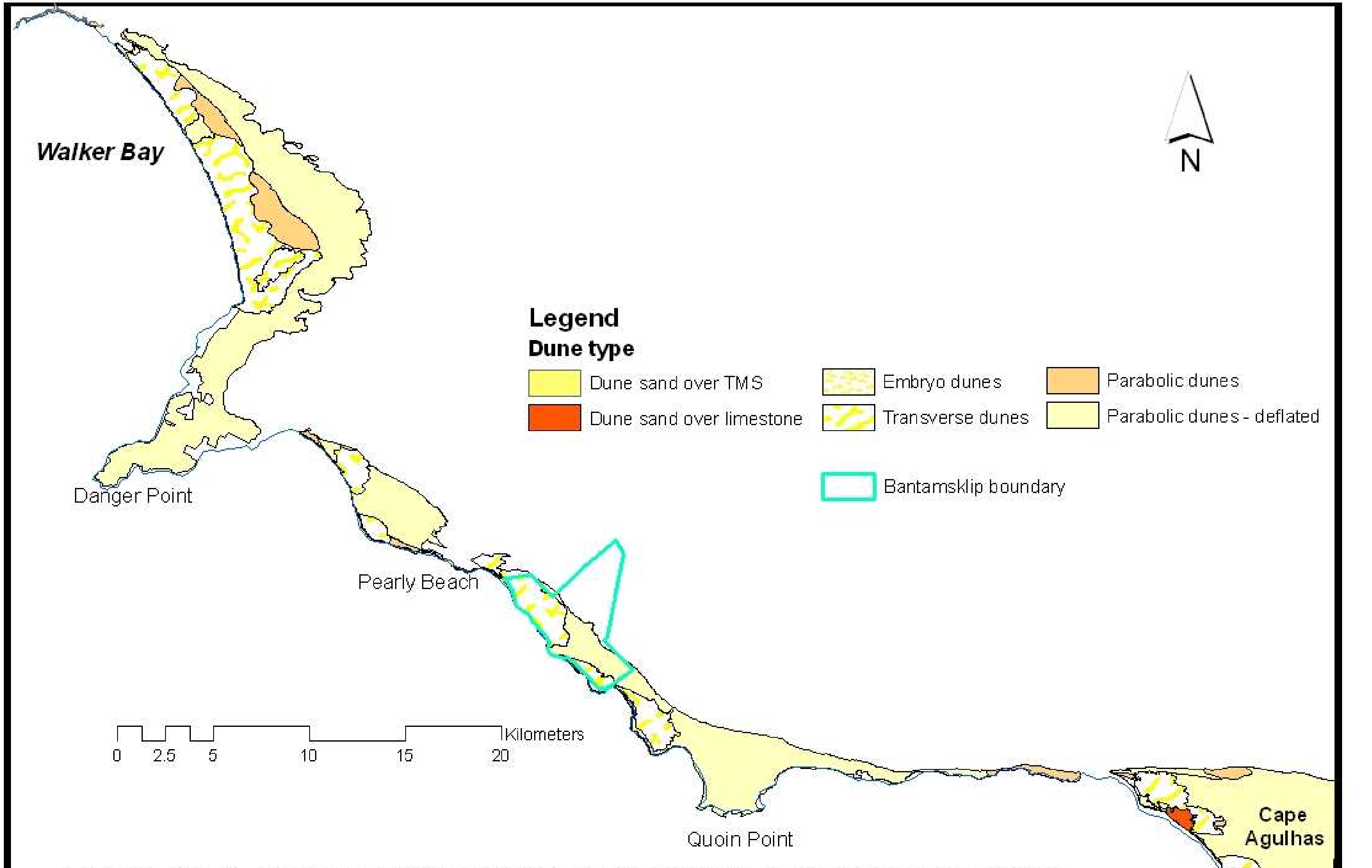


Figure 4.2.2. Dune systems of the Bantamsklip & environs coastline. Remapped and reclassified following Low & Pond (2006)

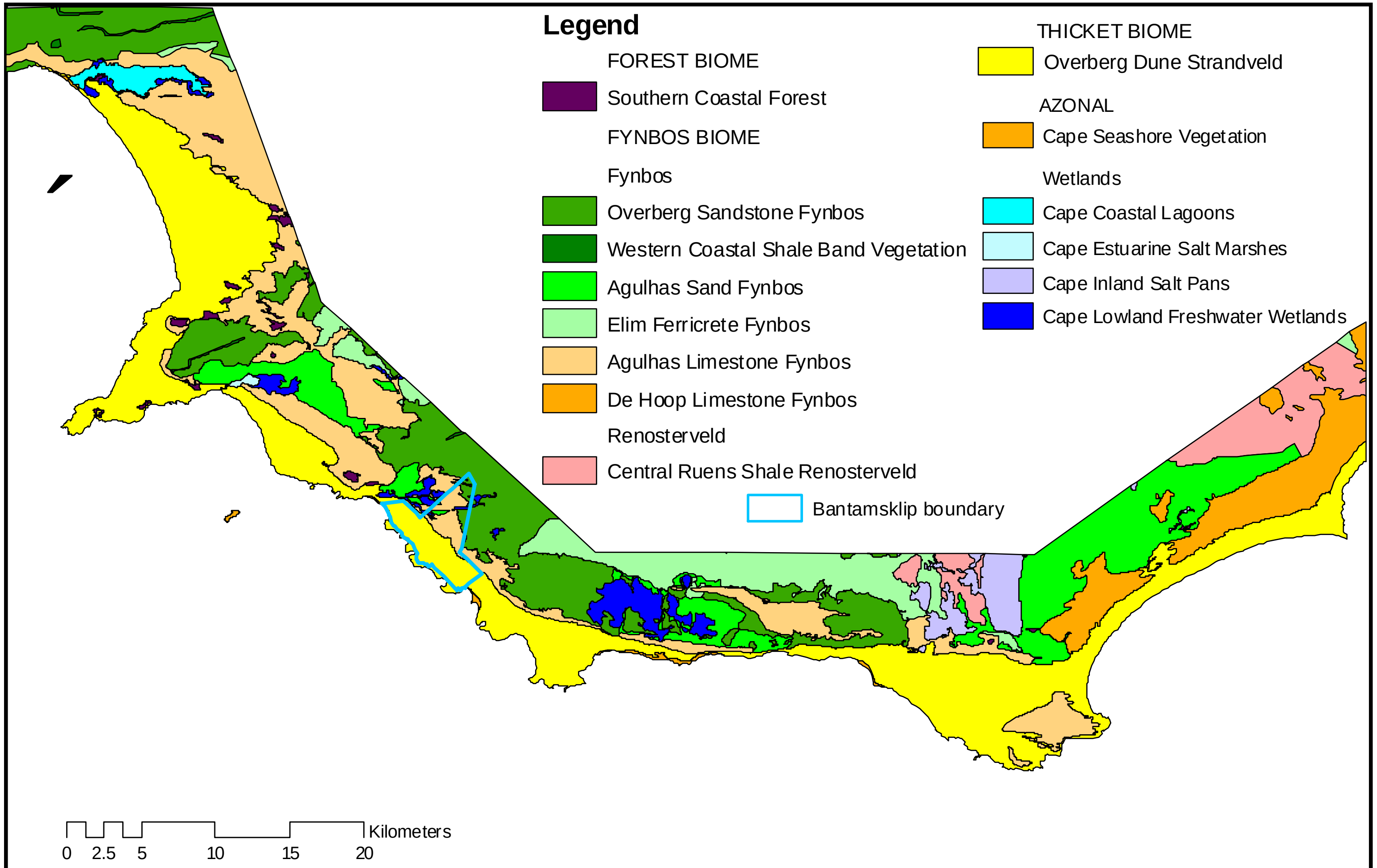


Figure 4.2.3. Vegetation types of the Bantamsklip & environs coastline (after Mucina & Rutherford, 2006)

Cole *et al*. (2000) record 36 types for the Agulhas Plain, although these might be described more as broad communities, a sub class of vegetation type. At a more detailed level, Cowling *et al*. (1988a) and Cowling *et al*. (1988b) provide an in-depth account of the broad plant communities of the Agulhas Plain. Altogether nine communities were described. Two non-fynbos communities were recognised: **Forest and Thicket**, dominated by *Sideroxylon inerme* milkwood, *Celtis africana* white stinkwood, *Olinia ventosa* hard pear and *Apodytes dimidiata* white pear. **Renoster shrubland** (= renosterveld) occurs on fertile shale and related sites on the Plain (*Themeda triandra* rooigras, *Ficinia tristachya, Pentaschistis colorata, Cynodon dactylon* kweek, *Dicerothamnus rhinocerotis* renosterbos, *Metalasia muricata* blombos, *Helichrysum patulum* kooigoed and *Stoebe capitata* knoppiesslangbos).

The remaining types are all fynbos: **Mesotrophic Asteraceous Fynbos**, a form dominated by members of the daisy family, is found on the fine-textured soils of the Elim land system (Thwaites & Cowling, 1988), often in association with ferricrete. Dominants include *Leucadendron elimense* Elim conebush, *L.modestum* skugtertolbos, *L.laxum* Bredasdorp conebush, *Metalasia muricata* blombos, *Phylica ericoides, Passerina galpinii, Disparago anomala, Erica lasciva* bruineheide, *E.bruniifolia* and *E.nudifolia.* **Dune Asteraceous Fynbos**, as its names implies, is confined to coastal dunes - between Langebaan and Port Elizabeth - but has strong affinities with, and is probably successional to, Dune Thicket (Strandveld) vegetation (see above). On the Agulhas Plain, this vegetation type forms a prominent element in Thwaites & Cowling's (1988) Die Dam Land System. Soils are deep and calcareous, and well-drained, but with high pH's. Dominant ericoid and smaller-leaved shrubs were *Passerina paleacea, Agathosma collina,* one of the boegoes, *Metalasia muricata* blombos and *Phylica ericoides,* illustrating some overlap with the previous type. Graminoids included *Ischyrolepis eleocharis* katstertriet, *Calopsis fruticosus* and *Ficinia lateralis* with broad-leaved dominants such as *Euclea racemosa* seeghwarrie, *Pterocelastrus tricuspidatus* kershout and various *Rhus* spp. taaibos. **Dry Restioid Fynbos,** with a high cover of restios (reeds) dominates this type, with common species including *Elegia tectora* besemriet, *E.recta, Thamnochortus erectus* jakkalsstertriet, *Leucadendron linifolium* knoppiesbos, *Cliffortia ferruginea* pypsteelbos and *Dicerothamnus rhinocerotis* renosterbos. This type occurred on colluvial sandstone or alluvial calcareous sands, usually neutral to alkaline. Local sites are often seasonally waterlogged, particularly in soils over sandstone or limestone.

Proteoid Fynbos, one of the key vegetation indicators on the Plain, is the most widespread vegetation type in the region. Three major communities are recognised: *Protea repens* dominated vegetation, which is confined to the ferricretes and silcretes of the area. Dominants include *Protea repens* sugarbush, *Leucadendron stelligerum, L.modestum* skugtertolbos, *L.xanthoconus* sickle-leaf conebush, *Leucospermum pedunculatum, Protea longifolia* swartbaard, *Metalasia muricata* blombos, *Stoebe capitata,* knoppiesslangbos, *Dicerothamnus rhinocerotis* renosterbos, *Erica serrata, E.puberuliflora, Ficinia tristachya, Ischyrolepis capensis* and *Rhodocoma fruticosa* kanet. The second type occurs - unusually for fynbos - on limestones and shallow calcareous sands over limestone in the area. As its name suggests, this type is dominated by proteoid shrubs. Common species include *Protea susannae* stinkblaarsuikerbos, *P.obtusifolia* Bredasdorp sugarbush, *Leucadendron muirii* kruiphout, *Leucospermum truncatum limestone* pincushion, *Leucospermum patersonii* basterkreupelhout, *Mimetes saxatilis* rooistompie, *Erica propinqua Passerina corymbosa* sandgannabos, *Metalasia muricata* blombos, *Euchaetis burchellii, Adenandra obtusata* kommetjieteewater, *Chrysanthemoides monilifera* bietou, *Morella quercifolia* maagpynbossie, *Rhus laevigata* duinetaaibos, *Stilbe ericoides, Thamnochortus guthrieae, T.paniculatus, Hypodiscus albo-aristatus, Restio triticeus* besemriet and *Ischyrolepis leptoclados* besemriet. The more typical mountain fynbos is restricted here to acid, infertile sandstone-derived soils. This is a very diverse vegetation type dominated by *Leucadendron platyspermum* swartbal, *L.xanthoconus* sickle-leaf conebush, *L.gandogeri, L.salignum* sunshine bush, *Protea compacta,* the well-known and commercially successful Bot River protea, *Protea longifolia* swartbaard, *Aulax umbellata* Christmasblom, *Erica filipendula, E.longiaristata, E.longifolia, E.melanaceme, E.plukenetii* hangertjiesheide, *E.klotzschii, E.globiceps, Staavia radiata* altydbossie, *Brunia laevis* vaalstompie, *Restio similis*, *Calopsis membranacea, Elegia filacea, Staberoha* spp., *Thamnochortus erectus* jakkalsstertriet, *Tetraria bromoides* bergpalmiet, *T.cuspidata* and *T.fasciata.*

It is important to note that the former two vegetation types are non-montane, with *Leucadendron platyspermum* and *Protea compacta* virtually confined to the area. However, some communities do spread as far east as the Gouritz River, but not further north than the Plain itself.

The final fynbos type is dominated by ericas and is called **Mesic Ericaceous Fynbos**. This type is rare in the area, confined to the Soetanysberg and Gansbaai, just to the west of Bantamsklip, but might extend as far east as the Potberg in De Hoop Nature Reserve. Soils tend to be rocky, shallow and infertile. As could be expected dominants are ericas and include *Erica coccinea* vlakteheide and *E.serrata,* as well as *Leucospermum cordifolium* speldekussing, *Elegia persistens, Chondropetalum deustum,* and *Tetraria thermalis* bergpalmiet.

The last vegetation type is azonal and incorporates the **wetlands and vleis** of the area. This type has been little-studied, although dominants do include *Sarcocornia* spp. (brack systems), *Phragmites australis* (neutral to fresh water) and various Restionaceae and Cyperaceae in acid waters.

The Proteoid Fynbos of the Agulhas Plain is rich in endemic species (Taylor, 1978; Cowling *et al*., 1988b). Correspondingly, although not biogeographically linked, *Sideroxylon-Celtis* forest is restricted to the Agulhas Plain as are three of the fynbos types discussed above. Preliminary analysis (Low, unpub.) indicates great variation and localised zonality within the Agulhas Plain wetlands, as well as between the latter and wetlands elsewhere in the south-western Cape and West Coast.

The vegetation of the approximately 40 km long coastline between Gansbaai and Quoin Point has been studied in some detail by Cowling *et al*., 1988b) (Figure 4.2.4), as has the Groot Hagelkraal site comprising much of Bantamsklip (Cowling, 1996). **Restioid Fynbos** (*Chondropetalum/Elegia* spp.), is confined to deep, seasonally waterlogged, largely neutral to calcareous, alluvial sand flanks of the Hagelkraal River and is also found at Donkergat. Cowling *et al*. (1988b) estimate there to be 14 threatened species occurring in this plant community and these include the regional and local endemics *Elegia deusta (Chondropetalum deustum), Euchaetis burchellii, Leucadendron linifolium* knoppiesbos and *Serruria nervosa* fluted spiderhead. Others are *Aristea palustris* (local endemic)*, Erica riparia* (local endemic), *Calopsis rigorata, Caryotophora skyatophytoides, Elegia prominens, E.verreauxii, Gladiolus guthriei* kaneelpypie, *Ischyrolepis sabulosa, Restio dodii, Staberoha multispicata, Thamnochortus dumosus, T.pellucidus* and *T.pluristachyus.* **Proteoid Fynbos** is characterised by high cover of members of the protea family, in particular *Leucadendron coniferum* duinegeelbos, and forms part of the broader *Protea susannae-Leucadendron coniferum* community. It is widespread on colluvial neutral to slightly acidic sands in the area.

A high number of 15 threatened species has been recorded from this community, including most of the above species, as well as *Diosma arenicola* (local endemic), *Erica lineata, Lampranthus arbuthnotiae, Pteronia tenuifolia* and *Spatalla ericoides* (local endemic). The third community is **Dune Asteraceous Fynbos**, discussed in some detail above. This is widely distributed on calcareous dune sands along this coastline and, although having a wide range (see above), nevertheless harbours a distinctive flora with several dune endemics including *Ischyrolepis eleocharis* katstertriet, *Calopsis fruticosa, Olea exasperata* slanghout and *Agathosma dielsiana.* It has a lower degree of species rarity, with *Amphithalea alba, Athanasia quinquedentata* subsp. *quinquedentata, Delosperma litorale* kalkklipvygie, *Diosma subulata, Erepsia simulans, Erica radicans, E.glabella* var. *laevis, Gladiolus overbergensis, Lampranthus arbuthnotiae*, *Lobostemon collinus*, *Phylica amoena* (local endemic) and *Mesembryanthemum (Prenia) vanrensburgii* seepampoen being typical. Thicket clumps are dominated by *Euclea racemosa* seeghwarrie, *Pterocelastrus tricuspidatus* kershout and *Robsonodendron maritimum* duinesybas.

Other broad plant groups include **Secondary Dune Fynbos/ Acacia Thicket**, (*Morella cordifolia* glashout, *Metalasia muricata* blombos, *Ischyrolepis eleocharis* katstertriet and *Ficinia lateralis; Acacia cyclops* rooikrans), the result of artificial planting of the (transverse) dunes with introduced aliens, and a **Rocky Shore Littoral Fringe** (*Phylica ericoides, Passerina paleacea, Euclea racemosa* seeghwarrie, *Pterocelastrus tricuspidatus* kershout, *Stenotaphrum secundatum* buffalo grass, *Cynodon dactylon* fine quick, *Sporobolus virginicus* brakgras), which, whilst only forming a narrow band along the coast where sandstone is exposed, nevertheless supports at least two threatened species: *Osteospermum hafstroemii* and *Phylica amoena* (local endemic). Along the sandy parts of the coast there is one further community, the **Sandy Littoral Fringe** (*Arctotheca populifolia* sea pumpkin, *Tetragonia decumbens* kinkelbossie (pers.obs.), *Thinopyrum distichum* sea wheat, and *Ammophila arenaria* marram grass), which represents much of the mobile dune system colonised by pioneering species. Rarity here is the lowest for the area, with *Osteospermum hafstroemii* the only threatened species being recorded. However, several species are endemic to this habitat, but enjoy a widespread distribution.

Cowling (1996) provides a brief account and fairly detailed map (Figure 4.2.5) of the plantlife of Groot Hagelkraal (which includes most of the Bantamsklip site). Several species are added to the list of Agulhas Plain endemics, although some have a wider distribution to the Kogelberg Nature Reserve (SaSFlora, 1998 - 2011): *Agathosma abrupta, Diosma awilana, Erica saxicola, E.pumilus* and *Spatalla squamata.* Species endemic to Groot Hagelkraal, including two new taxa, are: *Agathosma* sp.nov., *Diosma haelkraalensis, Erica calcareophila, E.occulta, Phylica* sp.nov. and *Spatalla ericoides*. Cowling (1996) claims 800 species for the area, with a high proportion of 2.6 % (21) being locally or regionally endemic. "This must rank as amongst the most extreme concentrations of point endemism anywhere in the world". Of particular note is that these species are all associated with the limestone habitat.

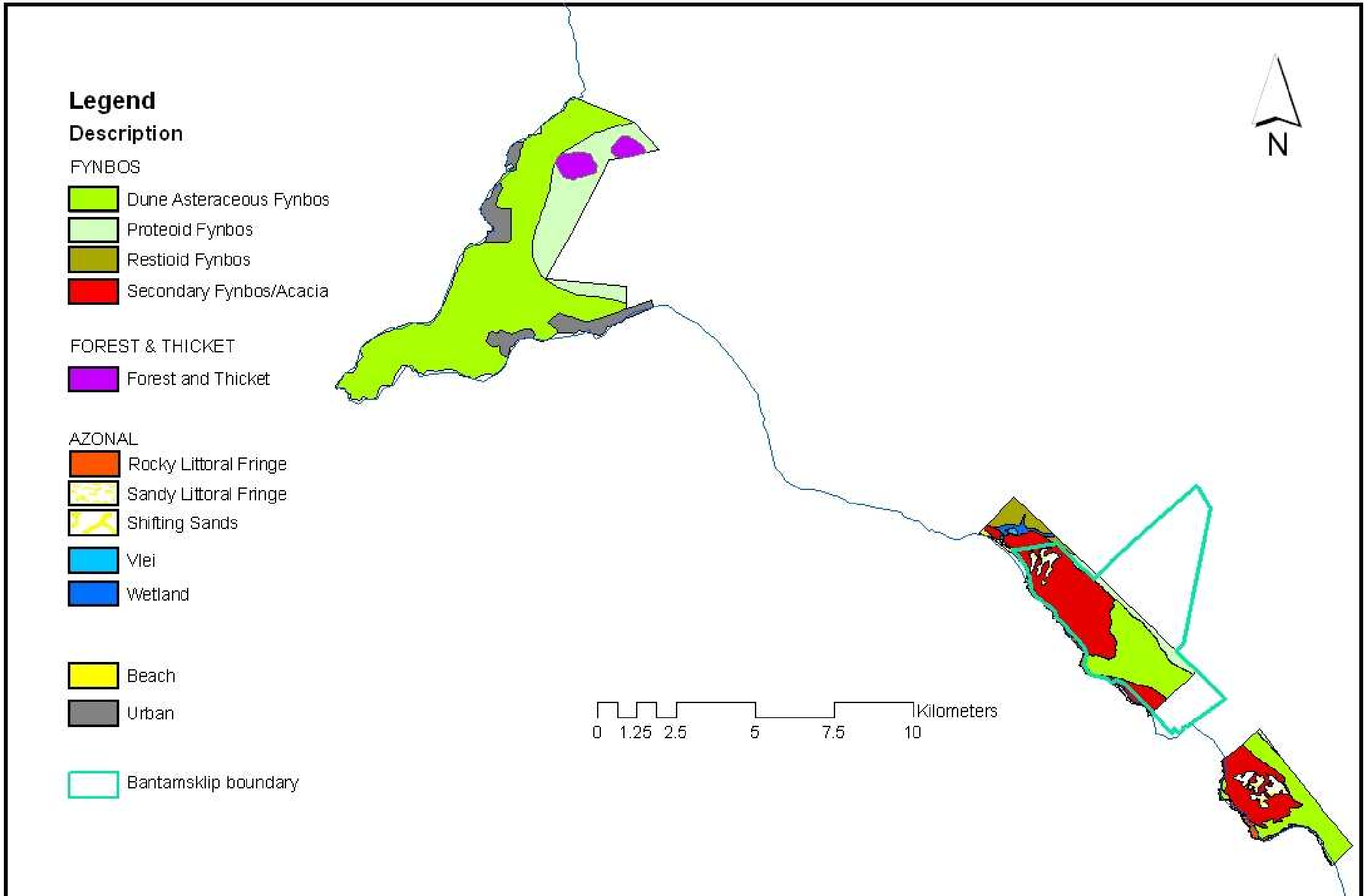


Figure 4.2.4. Plant communities of selected localities along the Gansbaai-Quoin Point coastline (after Cowling et al., 1988b)

The following major plant communities are present: **Acid Sand Proteoid Fynbos**, dominated by *Protea compacta* Bot River protea, *Leucadendron xanthoconus* sickle-leaf conebush, *Aulax umbellata* Christmasblom, *Staavia radiata* altydbossie, *Erica pulchella, E filipendula, Staberoha cernua* curly cones, *Restio similis* and *Tetraria bromoides.* In seasonally damp sites, *Elegia filacea* is likely to occur. The granite outcrop east of the Hagelkraal River (see above) has *Leucadendron elimense* bergkatjiepiering as a dominant, but little is known of this community. **Neutral Sand Proteoid Fynbos** is associated with colluvial sands derived from limestone and older coastal sands, with character species *Protea susannae* stinkblaarsuikerbos, *Leucadendron coniferum* duinegeelbos, *Diosma arenicola, Erica lineata* and *Euchaetis burchellii.* **Limestone Proteoid Fynbos** is typified by *Protea obtusifolia* Bredasdorp sugarbush, *Leucadendron meridianum* limestone conebush, *Mimetes saxatilis* limestone conebush, *Leucospermum patersonii* basterkreupelhout, *Erica propinqua, Diosma* spp., *Thamnochortus fraternus* and *Ischyrolepis leptoclados* besemriet. Occurring on the coastal dunes in the south of the site, **Dune Asteraceous Fynbos** is dominated by ericoid-leaved shrubs. Key species include *Passerina paleacea, Phylica ericoides, Metalasia muricata* blombos, *Agathosma* spp., *Muraltia satureioides* skilpadbos, *Ischyrolepis eleocharis* katstertriet, *Elegia microcarpa* and *Ficinia lateralis.* Thicket species, clumping locally, include *Euclea racemosa* seeghwarrie (pers.obs.), *Rhus glauca* bloukoeniebos, *Robsonodendron maritimum* duinesybas, *Pterocelastrus tricuspidatus* kershout and *Maytenus procumbens* duinekokoboom. Finally, small patches of **Forest and Thicket** of subtropical affinity are found in parts protected from fire, chiefly on the coast and on inland limestone scree slopes. Dominant species include *Sideroxylon inerme* milkwood, *Euclea racemosa* seeghwarrie, *Pterocelastrus tricuspidatus* kershout and *Olea exasperata* slanghout. Locally *Celtis africana* can be prominent, an unusual feature for this community.

Two azonal communities also occur at Groot Hagelkraal: hygrophilous fynbos (Figure 4.2.5) associated with wetlands, particularly those influenced by the Hagelkraal River (*Berzelia* spp., *Psoralea* spp. fonteinbos, *Leucadendron salicifolium* riviertolbos, *Osmitopsis asteriscoides* belskruie and *Prionium serratum* palmiet (pers.obs.)). Coastal strand vegetation (unmapped) associated with the mobile primary dunes is confined to a narrow strip along the coast and includes *Tetragonia decumbens* kinkelbossie, *Hebenstretia cordata, Arctotheca populifolia* sea pumpkin and *Ammophila arenaria* marram grass.

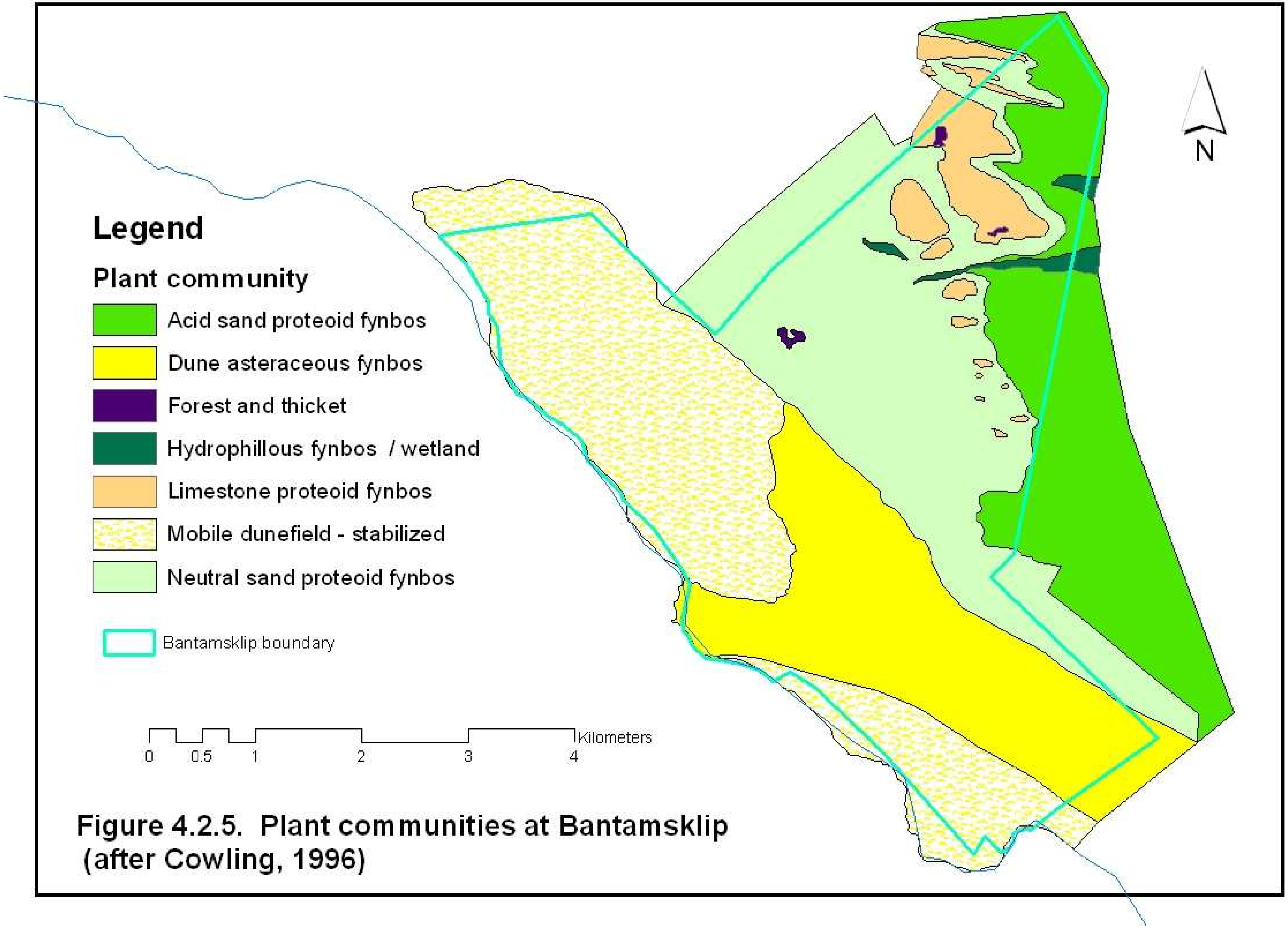


Figure 4.2.5. Plant communities at Bantamsklip (after Cowling, 1996)

4.2.2 Findings & discussion

a Soils

Soils data appear in Table 4.2.1. With a few exceptions, soils separate quite clearly in an MDS analysis, using all parameters (Figure 4.2.6), and there is a clear dichotomy between calcareous and non-calcareous substrates. This dichotomy is also reflected in the plant communities (see below), emphasising the role of soils in plant species and community distribution. Cohesion in the analysis is particularly noticeable in the inland and coastal limestones, as well as in the forest, also found on this substrate. Of interest is the high level of exchangeable calcium found in the wetland and river samples. These freshwater systems tend to be acidic elsewhere (Low, unpub. data) but here, interestingly take on an alkaline character.

Table 4.2.1. Results of the analysis of selected topsoils from Bantamsklip. Community descriptions in Table 4.2.2.

Plant community	pH	Resistance (Ohm)	Total P (mg/kg)	Bray no. 2 P (mg/kg)	Exchangeable cations				Total N (%)	Total C (%)	CEC (cmol/kg)
					Na	K	Ca	Mg			
BK1	8.5	620	273.981	482	2.27	0.36	85.65	9.10	0.519	3.09	3.75
BK2	9.2	490	247.489	9	0.92	0.08	15.26	0.76	0.065	0.09	1.17
BK3	8.6	2050	329.160	12	0.22	0.03	14.99	0.71	0.044	0.11	1.07
BK4	8.6	2650	219.600	8	0.11	0.03	18.16	0.36	0.061	0.17	1.22
BK5	8.0	2510	301.344	52	0.34	0.06	18.56	1.58	0.117	0.50	3.41
BK6	7.6	1960	165.052	73	0.21	0.24	16.86	1.26	0.164	2.06	3.98
BK7	6.1	1080	55.241	14	0.29	0.15	10.50	2.80	0.209	3.39	5.82
BK8	8.0	2310	71.902	**0**	0.13	0.05	20.29	0.67	0.130	1.21	3.86
BK9A	8.5	1180	356.332	7	0.29	0.11	19.77	0.84	0.084	0.69	2.44
BK9B	7.9	1000	156.208	1	0.35	0.12	21.96	1.74	0.202	2.00	4.78
BK10-1	7.7	1200	60.807	2	0.17	0.15	23.43	0.78	0.241	2.08	5.46
BK10-2	7.5	1470	33.751	10	0.18	0.10	16.08	1.23	0.181	1.58	5.69
BK11	5.6	2540	281.912	2	0.30	0.19	3.85	1.11	0.104	1.81	4.22
BK12	4.4	6020	14.410	1	0.10	0.04	1.27	0.47	0.038	0.57	3.48
BK13	4.3	2020	7.259	5	0.24	0.11	3.32	1.37	0.183	3.01	5.95
BK14A	4.9	7000	2.963	1	0.05	0.03	0.81	0.26	0.050	0.34	1.82
BK14B	5.4	2430	21.551	5	0.25	0.10	6.60	1.15	0.128	2.29	3.73
BK15	4.2	550	23.785	58	6.99	0.86	26.54	17.80	1.665	40.10	24.76
BK16A	5.0	430	23.422	46	4.44	0.48	45.92	13.69	1.077	25.50	24.48
BK granite	5.6	2020	31.779	5	0.44	0.13	4.28	1.65	0.110	1.45	3.64

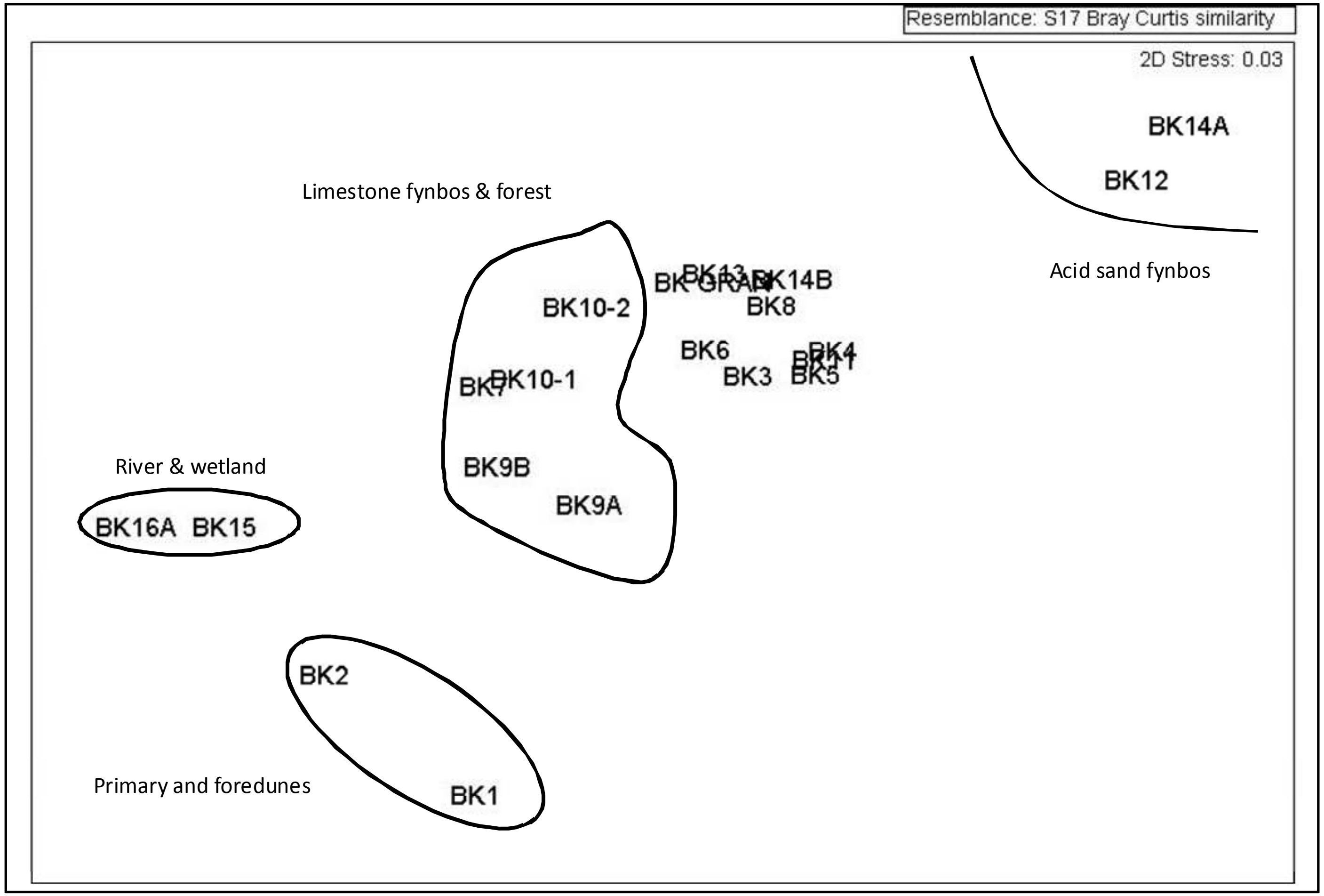


Figure 4.2.6. MDS analysis of soils from selected plant communities at Bantamsklip. Most soils separate out on the basis of the whole suite of parameters tested (Table 4.2.1), although trends in total C, N and CEC seem to be independent of soil origin. Plant community abbreviations described in Table 4.2.2

b Flora & vegetation

Individual species lists for Bantamsklip are shown in Appendix 4.2.1, with a composite list in Appendix 4.2.2. Species numbers for each site have been discussed above. The total species complement for the study is 463 (Table 4.2.2), against an expected 800 (Cowling *et al*., 1996). Dominant families are the Asteraceae (daisies) (63 – 13.6%), Cyperaceae (sedges) (35 – 7.5%), Restionaceae (reeds) 35 – 7.5%), Poaceae (grasses) (27 – 5.8%), Proteaceae (proteas) (25 – 5.4%), and Fabaceae (peas) (21 – 4.5%). Total species rarity is high for the Cape coast (50 – 10.7%) (Table 4.2.2) and is discussed in greater detail under the rarity assessment below.

Mapped plant communities, including plot locations, are shown in Figure 4.2.7, with a brief description of communities and a summary of species data in Table 4.2.2. Figure 4.2.8 shows images of the major plant communities. Images of individual species occurring in selected communities are shown in Plates 4.2.1, 4.2.2 and 4.2.3.

Communities with the largest extent are transverse dunes (672.9 ha - 27.9%), neutral to acid sand fynbos (606.2 ha - 25.2%) and dune fynbos on deflated parabolic dunes at the coast (507.9 ha – 21.1%). Other communities with over 100 ha coverage are acid sand fynbos (142.9 ha – 5.9%), coastal limestone fynbos (128.6 ha – 5.3%), and inland limestone fynbos (114.0 ha – 4.7%).

MDS analysis of plot data (Figure 4.2.9) indicates good separation into communities on calcareous and non-calcareous substrates. There is a strong affinity amongst primary, foredune and transverse dune sites, as well as in the coastal limestones. Interestingly the inland limestone fynbos has very low similarity with that of its coastal counterpart. Forest, too, displays a distinctive character. There is a close association of certain acid sand and sandstone communities, as is there is between hygric and wetter acid sand fynbos. These results, together with the soil analyses, indicate Cowling's (1996) neutral sand fynbos to have no status at Bantamsklip. Rather, separation of communities on the acid sands is probably driven by moisture rather than pH. In addition Cowling's azonal hygrophilous fynbos is clearly part of an association of acid sand fynbos communities and here is treated as a distinct fynbos community.

Vegetation similarity and dissimilarity is discussed in more detail below. Images illustrating the nature of each community are included with descriptions (Plates 4.2.1 to 4.2.16) with close-ups of key species found at each site (Plates 4.2.17 to 4.2.19).

Table 4.2.2. Plant communities at Bantamsklip (refer to Figure 4.2.5), together with summary of species data						
Plant community	**Description**	**Flora sample**	**Vegetation (plot) sample**	**Total plant species (Red Data)**	**Area (ha)**	**%**
Calcareous sands and limestones						
BK1	Rocky shore – shallow sand over sandstone bedrock	Yes	Yes	27 (1)	7.7	0.3
BK2	Primary dunes on coast	Yes	Yes	22 (1)	37.4	1.6
BK3	Foredunes at coast (mapped together with primary dunes)	Yes	Yes	31 (1)		
BK4	Vegetation (chiefly invasive *Acacia cyclops* rooikrans) of mobile to semi-mobile transverse dunes	Yes	Yes	23 (0)	672.9	27.9
BK5	Dwarf dune thicket at coast	Yes	Yes	54 (4)	24.8	1.0
BK6	Inland dune thicket	Yes	Yes	82 (3	8.5	0.4
BK7	Forest on limestone	Yes	Yes	25 (0)	2.9	0.1
BK8	Dune fynbos on deflated parabolic dunes	Yes	Yes	73 (8)	507.9	21.1
BK9	Coastal limestone fynbos	Yes	Yes	103 (8)	128.6	5.3
BK10	Inland limestone fynbos	Yes	Yes	89 (15)	114.0	4.7
BK11	Fynbos on sandstone in the northern part of the site	Yes	Yes	58 (10)	87.4	3.6
BK12	Acid sand fynbos	Yes	Yes	79 (10)	142.9	5.9
BK13	Hygric fynbos on acid sand	Yes	Yes	37 (0)	34.2	1.4
BK14	Neutral to acid sand fynbos	Yes	Yes	135 (13)	606.2	25.2
BK15	Wetland in north of site, connected to Groot Hagelkraal River	Yes	Yes	11 (0)	4.7	0.2
BK16	Groot Hagelkraal River	Yes	Yes	70 (0)	25.8	1.1
Developed	Developed areas, chiefly farmland	N/A	N/A	N/A	2.5	0.1
Total				**463 (50)**	**2 408.6**	**100.**

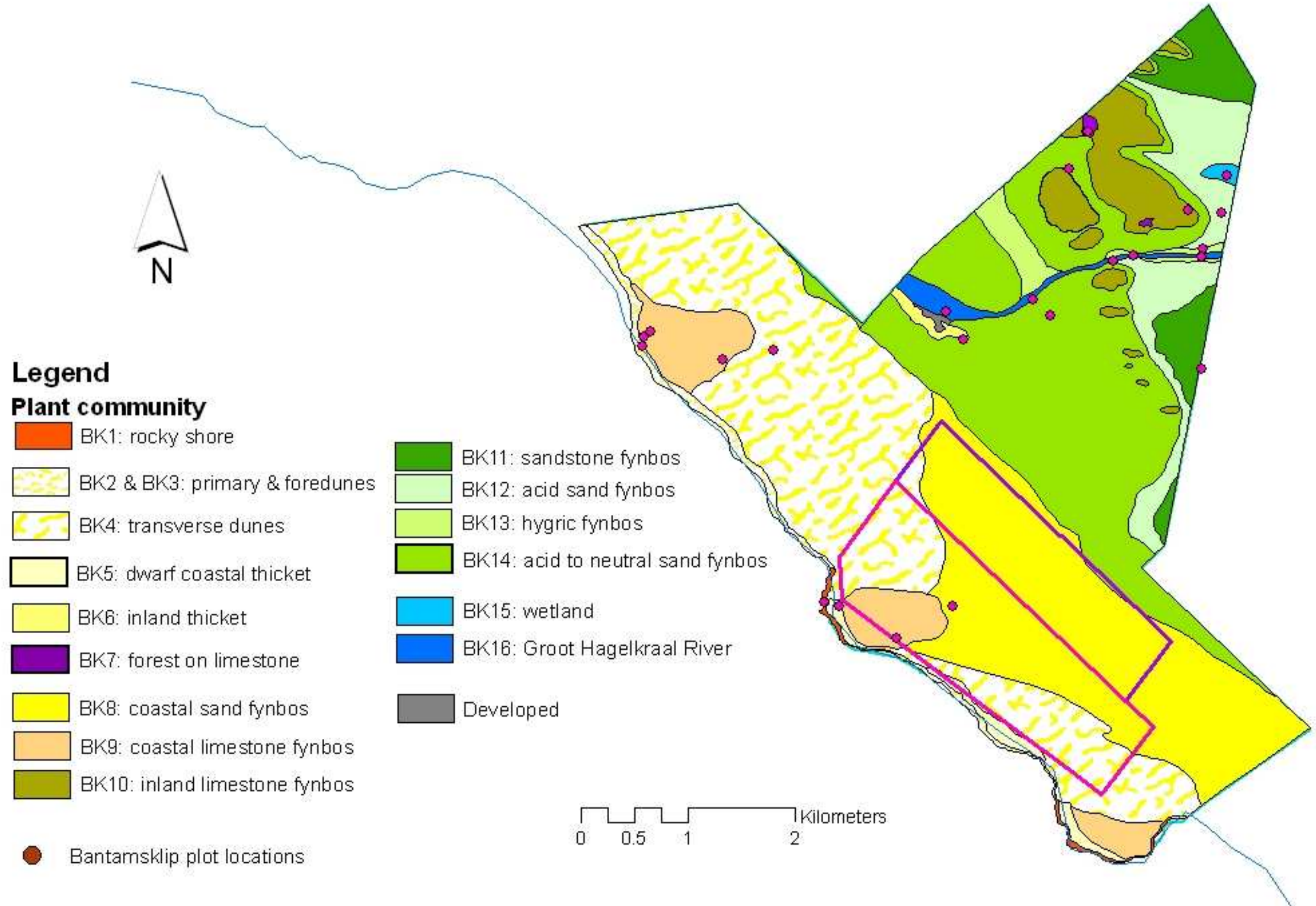


Figure 4.2.7. Plant communities occurring at Bantamsklip, showing position of proposed nuclear power station footprints. For community descriptions see the text and Table 4.2.2. Note position of vegetation plots

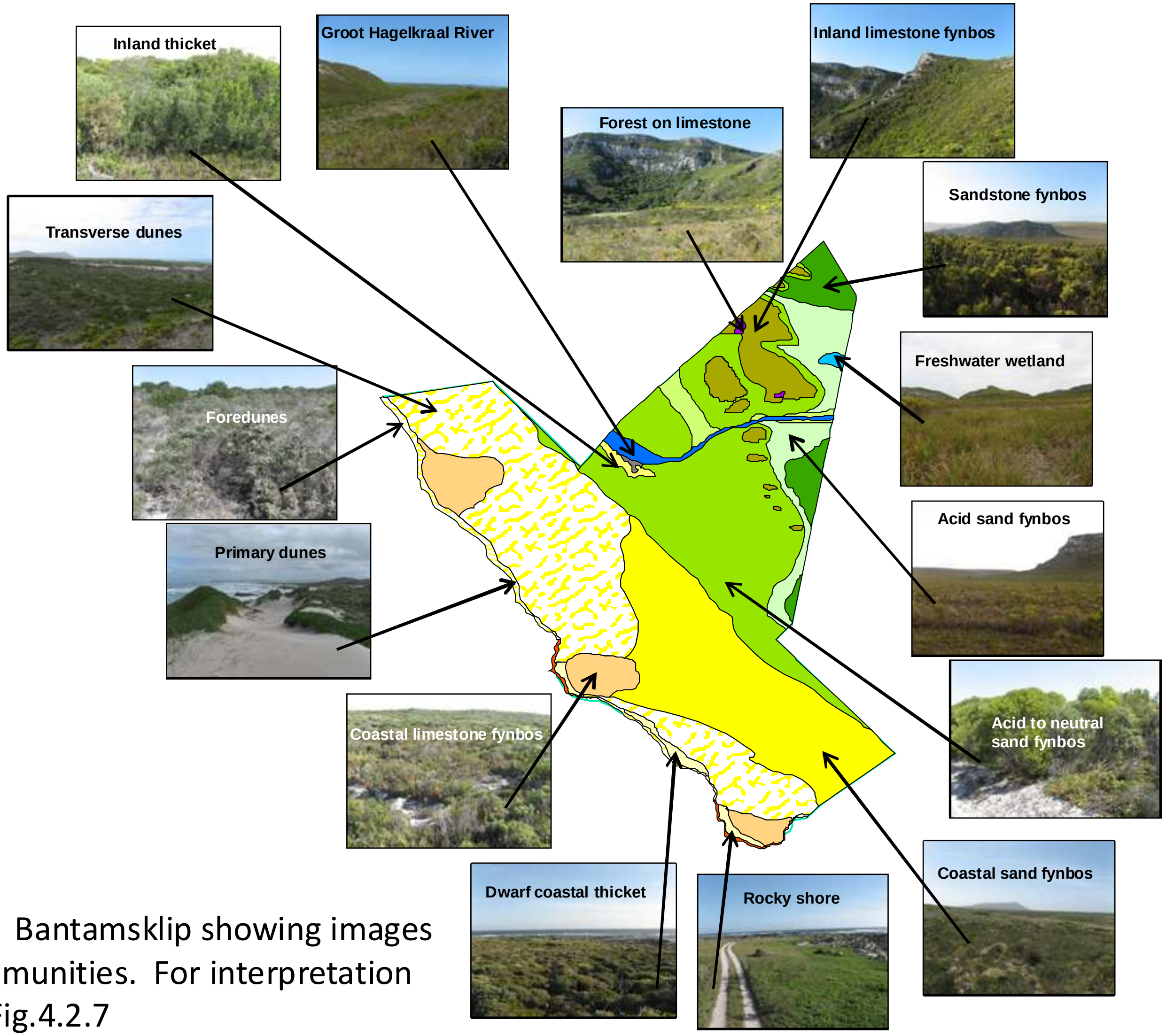


Figure 4.2.8. Bantamsklip showing images of plant communities. For interpretation of map see Fig.4.2.7

(i) Calcareous sands and limestones

Rocky shore (Community BK1) (Plate 4.2.1)

Synonyms: Cowling et al., 1988b; Cowling, 1996) - Rocky Shore Littoral Fringe; Mucina & Rutherford (2006) – Cape Seashore Vegetation

This is the vegetation just above the high-water mark (see Figures 4.2.7 & 4.2.8), where shallow calcareous sand over a rocky sandstone wave-cut platform is found. Although plant cover is high (usually 100%), height is low due to the harsher conditions experienced at the coast. Key species include *Bassia diffusa* soutbossie, *Cynodon dactylon* fine quick, *Dimorphotheca pluvialis* witbotterblom, *Mesembryanthemum vanrensburgii* and *Tetragonia decumbens* kinkelbossie. This community has a strong association with the primary dunes (Figures 4.2.7 & 4.2.8) which occur in the same zone, but where dune formation is more marked.

Species number is a modest 27 with one on the Red Data list (Table 4.2.2).

MDS analysis of vegetation plots (Figure 4.2.9) indicates a close association with the primary dunes, and a general relationship with the fore- and transverse dunes.

The narrowness of the community, confined as it is to a narrow strip just above the high-water mark, is reflected in its occupying only 7.7 ha (0.3%) of the site (Table 4.2.2).

Primary dunes (Community BK2) (Plate 4.2.2)

Synonyms: Cowling et al., 1988b - Sandy Littoral Fringe; Mucina & Rutherford (2006) – Cape Seashore Vegetation

As its name suggests, this is the vegetation of the pioneering coastal dunes, along with the rocky shore (BK1), located just above the high-water mark (Figures 4.2.7 & 4.2.8). Chief characteristic is mobile sand, with plant cover as a result low to moderate and plant height generally low. Key species include the introduced *Ammophila arenaria* marram grass, *Metalasia muricata* blombos, and *Tetragonia decumbens* kinkelbossie.

In the MDS analysis (Figure 4.2.9), this community enjoys a close relationship with that of the rocky shore, and to a lesser extent with the fore- and transverse dunes.

Due to the harsh coastal conditions, species numbers are predictably low (22) with one on the Red Data list (Table 4.2.2).

As with the above community, extent is small (37.4 ha – 1.6%) (Table 4.2.2).

Foredunes (Community BK3) (Plate 4.2.3)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - Sandy Littoral Fringe; Mucina & Rutherford – Cape Seashore Vegetation

This community forms an early part of the dune succession at the coast, where sands are slightly more stable and conditions less stressful for plantlife. As with its Primary Dunes counterpart (see above), this community is confined to a narrow strip along the coast, rarely moving more than 50 m inland (Figures 4.2.7 & 4.2.8). Cover and height are higher than in the primary system, with key species including *Carpobrotus acinaciformis* sour fig, *Ehrharta villosa* var. *villosa* pypgras, *Helichrysum patulum* kooigoed, *Metalasia muricata* blombos and *Psoralea repens* duine-ertjie.

The MDS analysis (Figure 4.2.9) shows the four pioneering communities at the coast to be fairly closely related, including a strong link with the transverse dunes.

For a pioneering community, species numbers are low as expected (31) with one Red Data taxon (Table 4.2.2).

This community has been mapped together with the primary dunes and shares the extent (37.4 ha) of the combined primary-foredunes system.

Plate 4.2.1: Rocky shore (Community BK1)

Plate 4.2.2: Primary dunes (Community BK2)

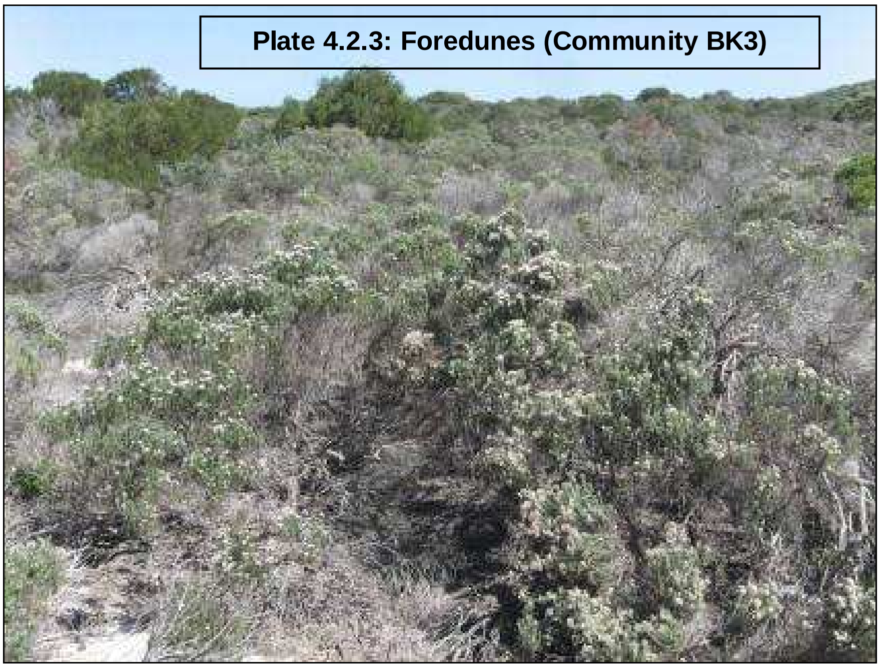


Plate 4.2.3: Foredunes (Community BK3)

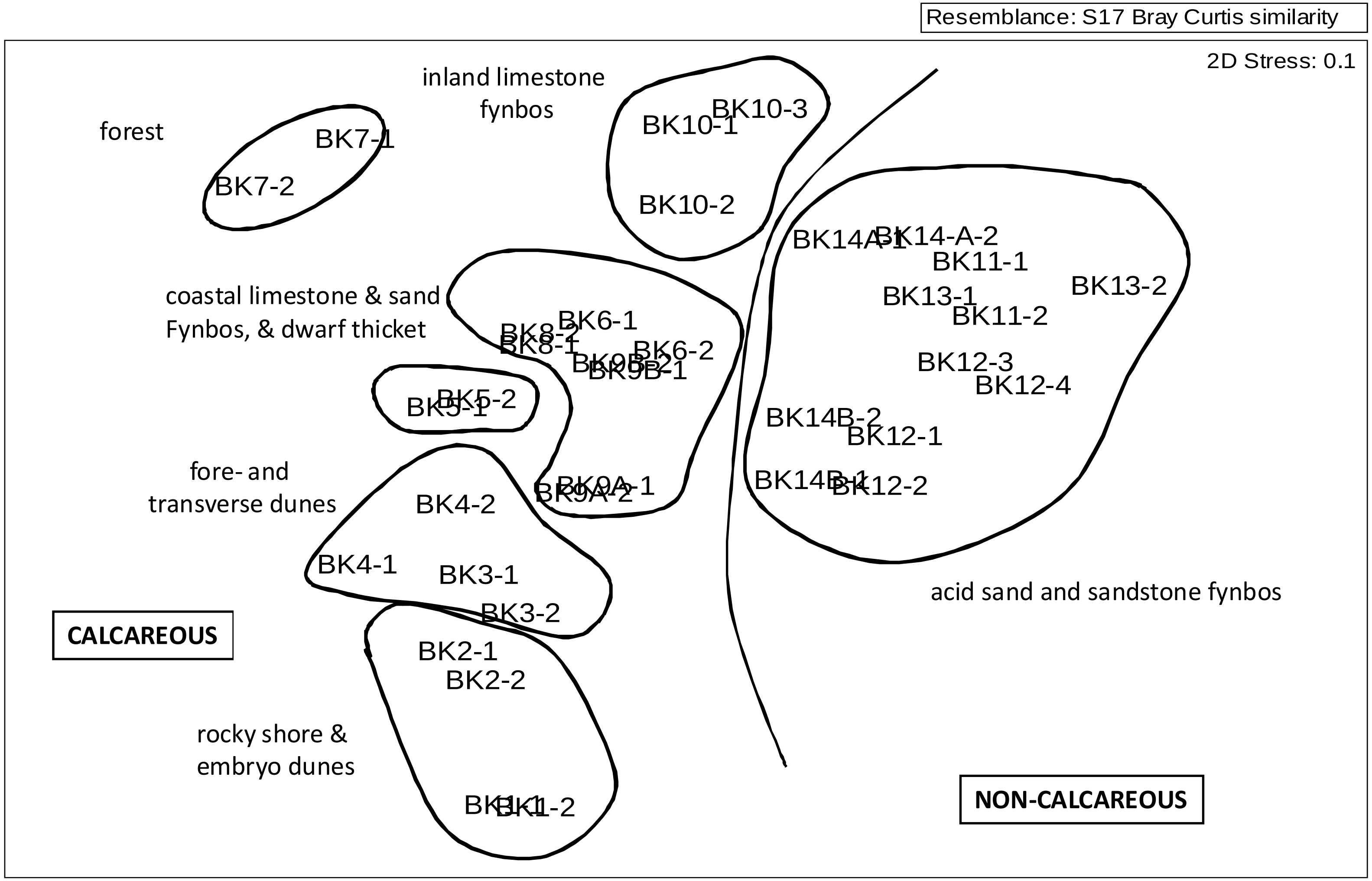


Figure 4.2.9. MDS analysis of plot data from Bantamsklip. Clear associations may be seen within the primary, fire and transverse dunes, acid sands, and limestones and coastal sands. The distinction between calcareous and non-calcareous substrates is also obvious. See the text and Table 4.2.2 for description of plant communities

Transverse dunes (Community BK4) (Plate 4.2.4)

Synonyms (Cowing et al., 1988b; Cowling, 1996): Secondary Dune Fynbos/ Acacia Thicket; Mucina & Rutherford (2006) – Overberg Dune Strandveld

These dunes (see Figures 4.2.7 & 4.2.8) have been historically planted with *Acacia cyclops* rooikrans to prevent driftsand and today this species is a problem invader in the area. Although naturally species numbers and cover tend to be low (pers.obs.), *A.cyclops* ironically permits the colonisation of mobile sands by other non-pioneer indigenous plants. Key species include *Acacia cyclops, Ficinia lateralis* dune sedge, *Metalasia muricata* blombos and *Morella cordifolia* dune waxberry. Vegetation tends towards fynbos, although several thicket species are present.

Analysis of vegetation plots (Figure 4.2.9) indicates a close association between this community and the foredunes, but a general relationship with the pioneering communities at the coast.

This has one of the lowest species numbers for the site (23), with none on the Red Data list (Table 4.2.2).

Transverse dunes occupy the largest area of any community at Bantamsklip (672.9 ha – 27.9%) (Table 4.2.2). The community is exclusively coastal and is found south of the R43.

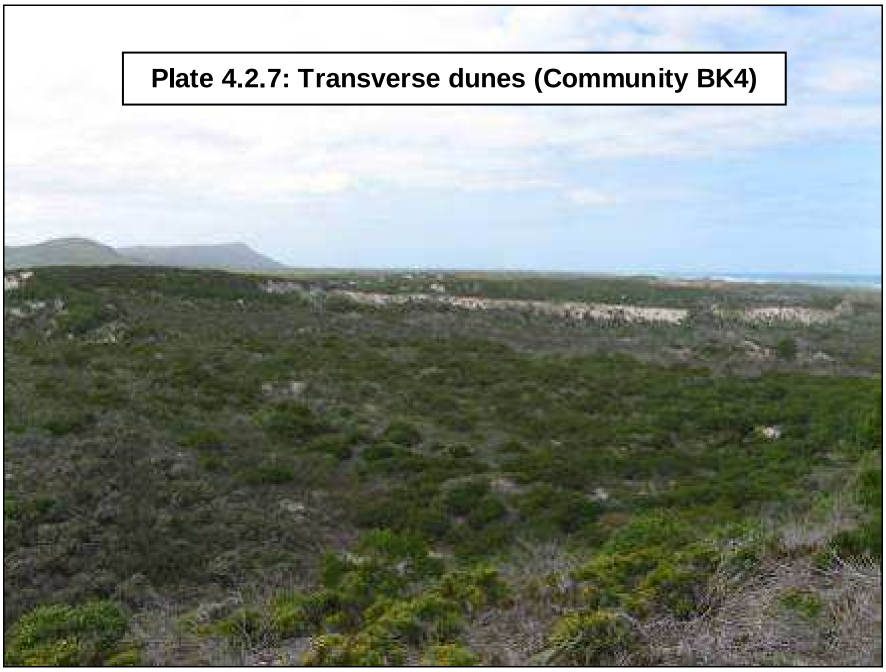


Plate 4.2.7: Transverse dunes (Community BK4)

Dwarf coastal thicket (Community BK5) (Plate 4.2.5)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - Thicket; Mucina & Rutherford (2006) – Overberg Dune Strandveld.

As its name implies, this thicket form is located near the coast, generally inland of the rocky shore, and primary and foredunes (see Figures 4.2.7 & 4.2.8). Although short (50 – 70 cm tall), it is a dense community, being dominated by broad-leaved shrubby elements. Key species include *Euclea racemosa* seeghwarrie, *Helichrysum revolutum* strandsewejaartjie, *Metalasia muricata* blombos, *Passerina* cf. *rigida* duinegonnabas and *Pterocelastrus tricuspidatus* kershout.

Although the MDS analysis of vegetation plots (Figure 4.2.9) shows this community as a separate entity, it has a fairly close relationship, at about 15% similarity, with the fore- and transverse dunes. This provides an indication of a successional relationship amongst these five coastal communities. However it bears little affinity with the inland thicket (see below and Figure 4.2.9).

Species numbers are virtually double those of each of the preceding communities (54), with four on the Red Data list (Table 4.2.2).

Extent of dwarf thicket for the whole site is 24.8 ha (1.0%) (Table 4.2.2).

Plate 4.2.5: Dwarf thicket at coast (Community BK5)

Inland dune thicket (Community BK6) (Plate 4.2.6)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - Thicket; Mucina & Rutherford (2006) – Overberg Dune Strandveld.

This community (see Figures 4.2.7 & 4.2.8) is located around the Groot Hagelkraal homestead, inland of the Gansbaai road. The substrate is probably a more recent dune which has blown inland from the coast, and which overlays a calcrete pan. Vegetation is dense, with individual plants reaching 2 m and taller. As with the dune thicket of the West Coast (see section on Duynefontein; Boucher, 1987), the community is a mosaic of thicket and dune fynbos.

Key species include *Carissa bispinosa* noem-noem, *Cassine peragua* bastersaffraan, *Euclea racemosa* seeghwarrie, *Ischyrolepis eleocharis* katstertriet, *Metalasia densa* blombos, *Olea exasperata* slanghout, *Chrysanthemoides monilifera* bietou, *Rhus lucida* blinktaaibos, *Cassytha ciliolata* dodder, *Osyris compressa* Cape sumach, and *Pterocelastrus tricuspidatus* kershout.

MDS analysis of vegetation plots shows this community to be distinctive (Figure 4.2.9), but with an interesting relationship (at about 20%) with the coastal and inland limestones.

A high total of 82 (3 Red Data) species was recorded from this site (Table 4.2.2).

Extent of inland thicket, the smallest coverage at Bantamsklip, is only 2.9 ha (0.1%) (Table 4.2.2).

Plate 4.2.6: Inland dune thicket (Community BK6)

Forest (Community BK7) (Plate 4.2.7)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - Forest; Mucina & Rutherford (2006) – Southern Coastal Forest.

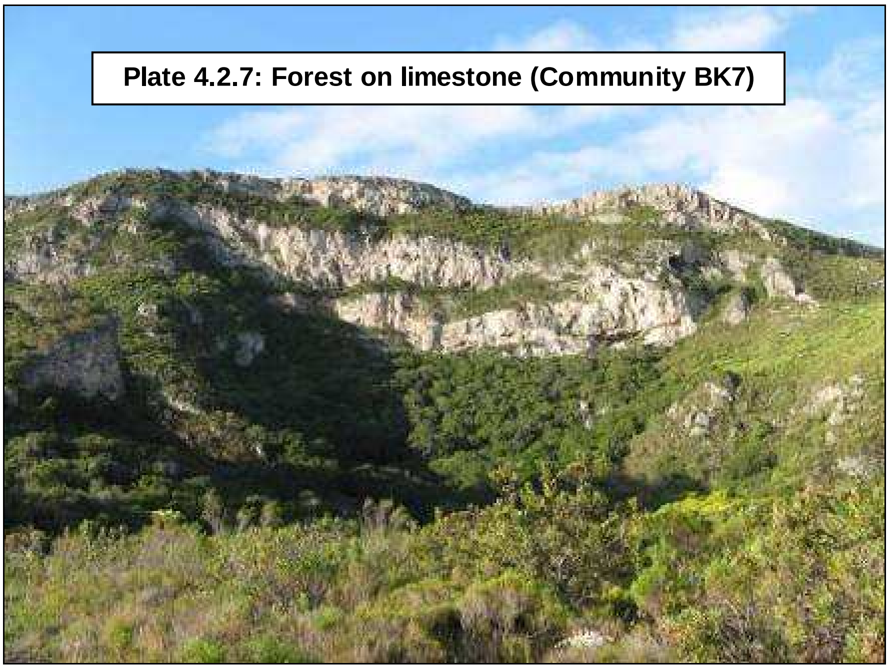
Forest is extremely localised along this coastline, with one of the main patches at Baardskeerdersbos (Taylor, 1961), about 8 km north of Bantamsklip. This community is rare on the site and is found in sheltered places on the inland limestones, usually in moister sites (see Figures 4.2.7 & 4.2.8) This relatively species-poor community is dominated by taxa including *Celtis africana* white stinkwood, *Sideroxylon inerme* milkwood, *Chionanthus foveolatus* fine-leaved ironwood, with *Stipa dregeana* steekgras providing the main understory cover. Trees reach a height of some 10 m.

Analysis of vegetation plots (Figure 4.2.9) indicates this community to be totally distinctive with a very low relationship with any of the other sites.

Species number is low (25) with no Red Data taxa recorded (Table 4.2.2).

Extent of this community is 2.9 ha (0.1%) (Table 4.2.2).

Plate 4.2.7: Forest on limestone (Community BK7)



Dune fynbos on deflated parabolic dunes (Community BK8) (Plate 4.2.8)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - Dune Asteraceous Fynbos; Mucina & Rutherford (2006) – Overberg Dune Strandveld.

This plant community (see Figures 4.2.7 & 4.2.8) appears to colonise older, deflated parabolic dunes that have been fairly well-leached (Cowling, 1988b), but nevertheless retain a high degree of calcium (see Table 4.2.1). This habitat seems to be specific to the Southern and Eastern Cape regions where it is prominent for long stretches of coastline (Cowling *et al*, 1988b; Low & Pond, 2006b). It is absent from the West Coast (Boucher, 1987; pers.obs., and also see section on Duynefontein above). Correspondingly vegetation on this dune system is restricted to the southern and eastern parts. As Cowling *et al.* (1988b) imply, the community is dominated by the Asteraceae (daisy) family, although locally other species may replace this group. Key species include *Disparago ericoides* basterslangbos, *Erica coccinea* vlakteheide, *Ischyrolepis eleocharis* besemriet, *Metalasia brevifolia* blombossie, *Otholobium bracteolatum* skaapbostee and *Passerina rigida* duinegonnabas, with individuals reaching between 1 m and 2 m.

This community shows a strong affinity with coastal limestone fynbos (Figure 4.2.9, and see below) and it is likely the two are located on a gradient driven by depth of sand over limestone, but some distance from the high-water mark to avoid the wind and salt spray which govern the pioneering vegetation along this coastline.

Species numbers are relatively high (73) with eight on the Red Data list (Table 4.2.2).

This community occupies a significant proportion of the site (507.9 ha – 21.1%) (Table 4.2.2)

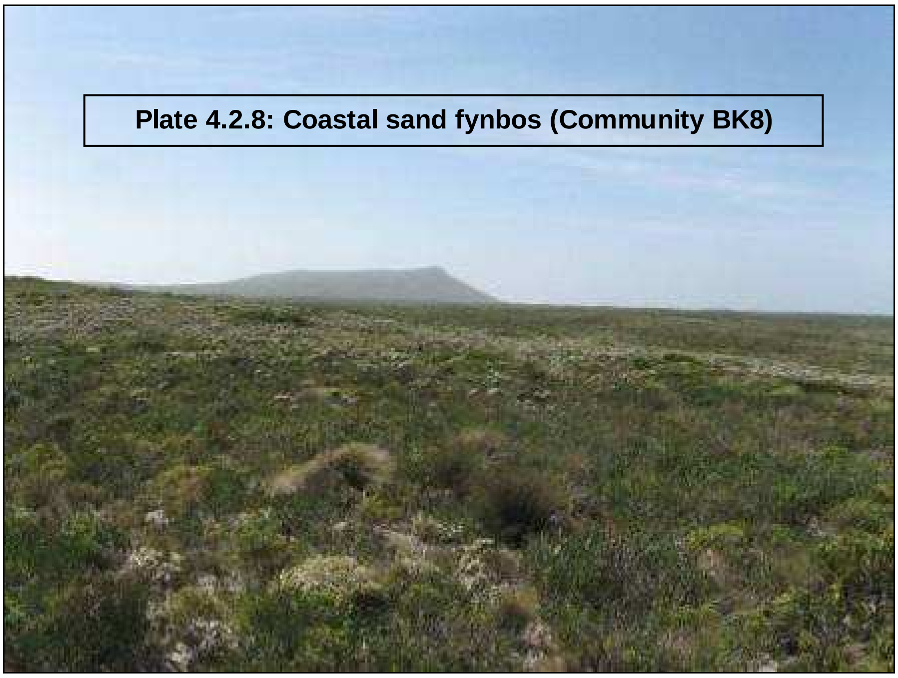


Plate 4.2.8: Coastal sand fynbos (Community BK8)

Coastal limestone fynbos (Community BK9) (Plate 4.2.9)

Synonyms: Cowling et al., 1988b; Cowling, 1996 only describe proteoid limestone fynbos; Mucina & Rutherford (2006) – Agulhas Limestone Fynbos, although, like Cowling, this unit is not mapped at the coast.

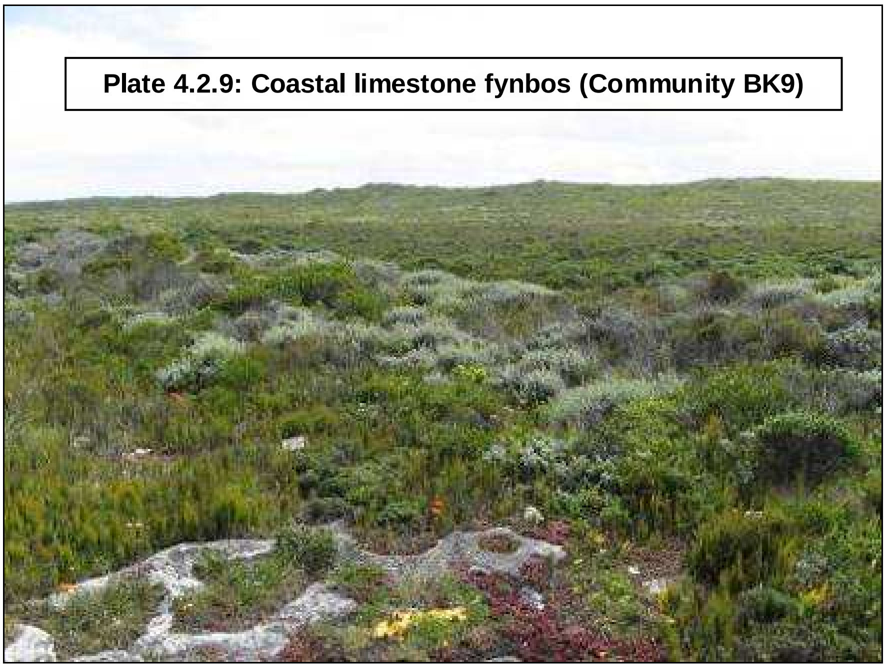
Limestone is exposed locally at the coast (Figures 4.2.7 & 4.2.8) and this results in a community which is influenced by both soil depth as well as coastal conditions, but which extends inland for only a kilometre (*sensu* Figure 4.2.7). Plant height is low (25 cm, rarely 50 cm) with cover to about 85%. Key species include *Ischyrolepis eleocharis* katstertriet, *Otholobium bracteolatum* skaapbostee, *Helichrysum* cf. *dasyanthum* kooigoed, *Muraltia satureioides* skilpadbos, *Senecio* cf. *arniciflorus, Disparago ericoides* basterslangbos and Erica *coccinea* vlakteheide. The presence of *Elegia tectora* dekriet, *Falkia repens* oortjies and *Juncus kraussii* biesie on the limestones in the south-west indicates localised wetting but not a wetland *per se.*

Although the coastal limestones are fairly closely aligned (Figure 4.2.9), there is very low similarity (<5%) with their inland counterparts; in fact there is closer association with the pioneering floras at the coast (Figure 4.2.9) than the inland limestones and other communities on calcareous substrates. A distinction should thus be made for coastal and inland limestone fynbos, and this is strongly influenced by the presence or absence of the Proteaceae (see Cowling, 1988b). This differentiation is also apparent in the Sandberg area, west of Cape Agulhas (Low & Pond, 2006b, and unpub.) where there is a two way gradient of depth of sand over limestone and distance from the coast.

Species number of this community is the second highest recorded for the area (103, with eight on the Red Data list) (Table 4.2.2).

Extent is 128.6 ha (5.3%) (Table 4.2.2).

Plate 4.2.9: Coastal limestone fynbos (Community BK9)



Inland limestone fynbos (Community BK10) (Plate 4.2.10)

Synonyms Cowling et al., 1988b; Cowling, 1996 - Limestone Proteoid Fynbos; Mucina & Rutherford (2006) – Agulhas Limestone Fynbos.

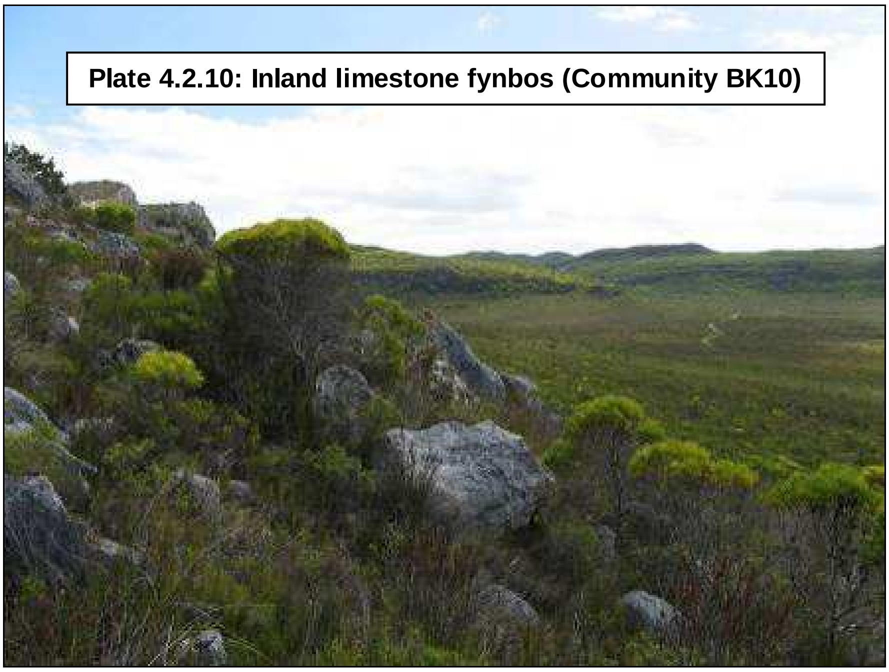
This is the vegetation of the inland limestone hills of the region, situated some distance from the coast (Figures 4.2.7 & 4.2.8). Proteaceae tend to dominate, as do other typical fynbos elements such as the Ericaceae and Restionaceae, whilst there is also a strong presence of other ericoid-leaved shrubs. Plant cover is modest (about 75%) with individuals reaching 1 m and occasionally 1.5 m. Key species include *Berkheya coriacea* disseldoring, *Hypodiscus willdenowia, Leucadendron meridianum* limestone conebush, *Phylica* cf. *dodii* and *Thamnochortus fraternus.*

MDS analysis of plots shows the community to be distinct, but with a low, if not intriguing, association (<5%) with fynbos on sandstone and the sands of the inland plain (Figure 4.2.9).

Species number is high (89) with the greatest number of Red Data taxa (15) for the site (Table 4.2.2).

The community covers some 114.0 ha (4.7%) (Table 4.2.2).

Plate 4.2.10: Inland limestone fynbos (Community BK10)



(i) Sandstone

Fynbos on sandstone (Community BK11) (Plate 4.2.11)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - Proteoid Fynbos; Mucina & Rutherford (2006) – Overberg Sandstone Fynbos.

This is Cowing *et al*.'s (1988b) sandstone form of proteoid fynbos (see Figures 4.2.7 & 4.2.8) which dominates large parts of the landscape where sandstones of the Table Mountain Group are exposed (*sensu* Gresse & Theron, 1997). Typically proteoids emerge to about 1.5 m, over an understory of ericoid-leaved shrubs, restios and occasionally sedges, with cover at 95%. Key species include *Erica plukenetii* hangertjie, *Leucadendron xanthoconus sickle*-leaf conebush, *Leucospermum cordifolium* speldekussing, *Protea compacta* Bot River protea, *P.longifolia* swartbaard and *Restio* cf. *triticeus* besemgoed.

Analysis of plot data (Figure 4.2.9) indicates a community with a strong association with acid to neutral sands of the plain (BK14), and not the wetter acid sands (BK12 and BK13). Having said that, the sandstone fynbos has a mere 15% similarity with that of the drier sand fynbos.

Species number for this community is a modest 58, but with a high proportion (10) of Red Data species (Table 4.2.2).

The community is confined to the eastern and northern margins of the site, occupying 87.4 ha (3.6%) (Table 4.2.2).

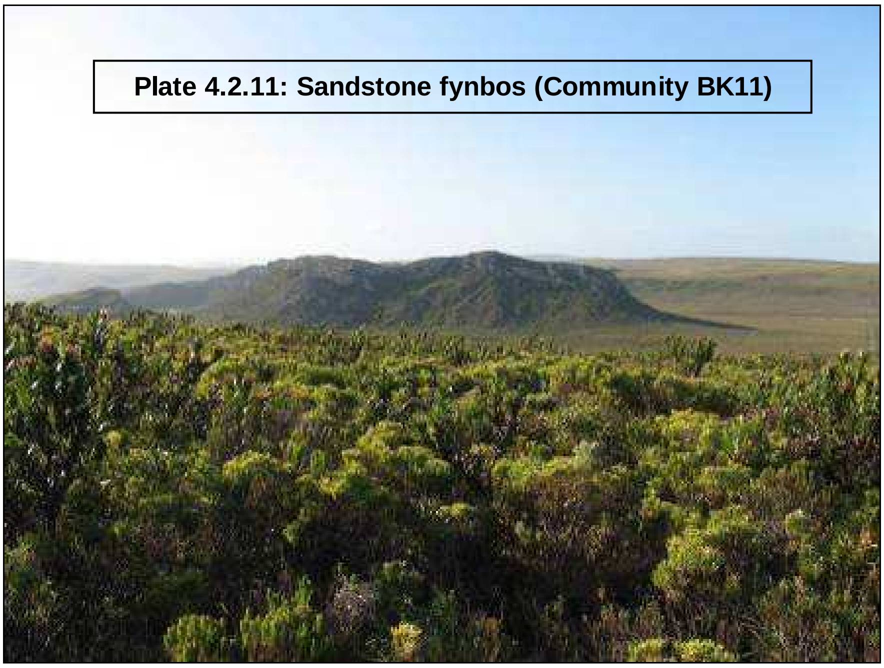


Plate 4.2.11: Sandstone fynbos (Community BK11)

(ii) Neutral to acid sands

Wet acid sand fynbos (Community BK12) (Plate 4.2.12)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - Acid Sand Proteoid Fynbos; Mucina & Rutherford (2006) – Agulhas Sand Fynbos.

This community abuts the sandstone slopes and occupies older colluvial sands, which appear to be largely sandstone-derived. Ironically, it does not display an expected close similarity with its sandstone counterpart (Figure 4.2.9) although it does cluster with general acidic substrate formations. Height of the vegetation tends to be less than 1 m, with cover at about 85%. Key species include *Cassytha ciliolata* dodder, *Erica* cf. *axillaris* bruinbasterheide, *Erica imbricata* kêr-kêr, *Leucadendron xanthoconus* sickle-leaf conebush and *Penaea mucronata.*

MDS analysis (Figure 4.2.9) of vegetation plots places this community with that of hygric fynbos (see BK13, below). The link is understandable, with damp to wet-loving species such as *Berzelia lanuginosa* vleiknopbos, *Leucadendron xanthoconus, Drosera trinervia* and several restios present in both communities.

Species number 79 with a high proportion (10) on the Red Data list (Table 4.2.2).

This community is found on sandy flats in the northern part of the site (142.9 ha – 5.9%) (Table 4.2.2).

Plate 4.2.12: Wet acid sand fynbos (Community BK12)

Hygric acid sand fynbos (Community BK13) (Plate 4.2.13)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - (azonal) hygrophilous fynbos; Mucina & Rutherford (2006) – Agulhas Sand Fynbos.

Although Cowling *et al*. (1988b) claim this to be an azonal community, probably because of its association with azonal wetlands and the Groot Hagelkraal River in the north of the site, MDS analysis (Figure 4.2.9) shows a clear similarity (20%) with the drier acid sand fynbos (BK12) described above. This is a dense community (100%) with plants reaching over 2.5 m (Figures 4.2.7 & 4.2.8). It is probably associated with underlying seepages.

Key species include *Berzelia lanuginosa* vleiknopbos, *Leucadendron salicifolium* riviertolbos, *Merxmuellera cincta* olifantsgras, *Morella quercifolia* maagpynbossie and *Phylica axillaris* subsp. *maritima*.

A total of only 37 species (no Red Data) was recorded from this community (Table 4.2.2).

The extent of this community is 34.2 ha (1.4%) (Table 4.2.2).

Plate 4.2.13: Hygric acid sand fynbos (Community BK13)

Moist neutral to acid sand fynbos (Community BK14) (Plate 4.2.14)

Synonyms: Cowling et al., 1988b; Cowling, 1996 - Neutral Sand Proteoid Fynbos; Mucina & Rutherford (2006) – Agulhas Sand Fynbos.

Cowling *et al*., 1988b, describe this form of fynbos (see Figures 4.2.7 & 4.2.8) as occurring on neutral to slightly acid sands. However, soil analysis (see Table 4.2.1 above) indicates the sands of the area north of the Gansbaai road all to be acidic. Whilst there is possibly a narrow strip of neutral sands abutting the limestone hills, as intimated by Cowling *et al*. (1988b), the differentiation amongst the vegetation of these sands is more than likely to be driven by soil moisture, i.e. a gradient influenced by the latter and not predominantly by chemistry or pH.

This is borne out by the MDS analysis where the drier sands (BK12) associate with the acidic sandstone, and in a general grouping with the acidic, yet wetter, communities BK12 and BK13 (see above).

Key species include *Leucadendron coniferum* geeltolbos, *Leucadendron linifolium* kraaltolbos, *Leucadendron xanthoconus* sickle-leaf conebush, *Mimetes cucullatus* rooistompie, *Penaea mucronata, Protea obtusifolia* limestone sugarbush, *P.susannae* stinkblaarsuikerbos and *Restio* cf. *triticeus* besemgoed.

This community has the highest number (135) of species for all of the communities described for the site, 13 of which are on the Red Data list (Table 4.2.2).

The extent of the community, the second largest area on the site, is 606.2 ha (25.2%) (Table 4.2.2).

Plate 4.2.14: Moist neutral to acid sand fynbos (Community BK14)

(iii) Wetland

Wetland (Community BK15) (Plate 4.2.15)

Synonyms Cowling et al., 1988b; Cowling, 1996 - azonal wetlands; Mucina & Rutherford (2006) – Cape Lowland Freshwater Wetlands.

Wetlands do not feature prominently at Bantamsklip, south of the Gansbaai road. However, seeps are fairly extensive to the north and are associated with wet fynbos (see above) and the Groot Hagelkraal River (see Figures 4.2.7 & 4.2.8). The wetland sampled in this study, wedged as it is between the limestone hills of the north and the River, clearly drains an alkaline, calcium rich substrate and this is evidenced in the soils analysis (Table 4.2.1), which also shows an unusual juxtaposition, almost a contradiction, of an acid soil high in exchangeable calcium. Nevertheless this is a freshwater system, as is shown by the dominance of *Carpha glomerata* vleibiesie as well as *Merxmuellera cincta* olifantsgras.

Although the results are not presented here, a MDS analysis was undertaken which included the wetland and riverine sites. This indicated a slight similarity with the wetter acid sand communities, and a moisture gradient between damp acid sand fynbos and the wetland/riverine sites.

As with many Cape freshwater wetlands (Low, unpub.), the species complement is extremely low (11) with none on the Red Data list (Table 4.2.2).

This is a very small community, occupying only 4.7 ha (0.2%) (Table 4.2.2).

Plate 4.2.15: Azonal freshwater wetland linked to the Groot Hagelkraal River in the north of the site (Community BK15)

(iv) River

Groot Hagelkraal River (Community BK16) (Plate 4.2.16)

Synonyms Cowling et al., 1988b; Cowling, 1996: azonal riverine; Mucina & Rutherford (2006) – Cape Lowland Freshwater Wetlands.

The Groot Hagelkraal River (Figures 4.2.7 &4.2.8) dissects the site and eventually feeds into the sea just east of Pearly Beach. For the purposes of this study, only the upper reaches have been considered as the lower parts are located outside the Bantamsklip property. The Freshwater Consulting Group will deal in more detail with this system and also the wetland. Suffice to say, this is an exceptional riverine system, with distinctive vegetation not allied to the hygric fynbos abutting the river. The dominant species is *Prionium serratum* palmiet, which forms extensive stands along the length of this ostensibly longitudinal wetland.

Seventy species, none Red Data, recorded from five localities along the river, are found in this community (Table 4.2.2). Although there is fairly marked variation along its length, only the upper *Prionium*–dominated section has been sampled for vegetation. However, the floristic assessment has to some extent covered the variation along the river (see below).

The river is some 25.8 ha in extent (1.1 %) (Table 4.2.2).

Plate 4.2.16: Groot Hagelkraal River in the centre of the site (Community BK16)

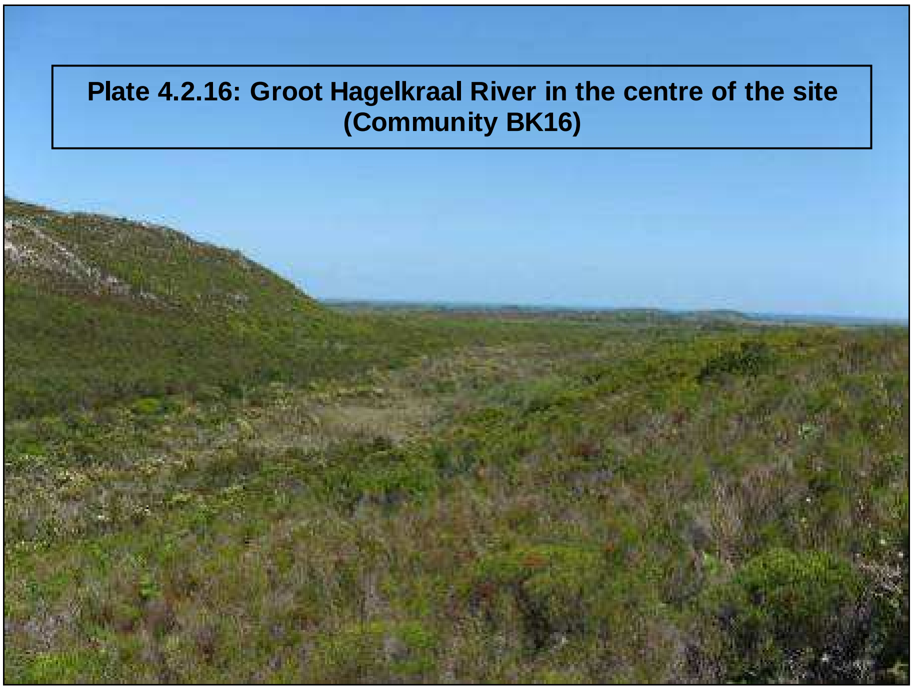


Plate 4.2.17 Sandstone and acid fynbos flora at Bantamsklip

Moraea neglecta geelflappie

Leucospermum pedunculatum white trailing pincushion – regional endemic

Lampranthus tenuifolius local endemic, new range extension and critically threatened

Tetraria thermalis common on sandstone and with good post fire recovery

Protea compacta Bot River protea – regional endemic and Red Data species

Plate 4.2.18 Limestone flora at Bantamsklip

Gladiolus variegatus regional endemic, and confined to limestones

Osyris speciosa regional endemic, often on limestone

Lampranthus ceriseus – endemic to limestone and regional endemic. This species is on the Red Data list

Leucospermum patersonii basterkreupelhout – coastal limestone and regional endemic, as well as on the Red Data list

Mimetes saxatilis rooistompie, limestone and local endemic, and an Endangered species

Plate 4.2.19 Coastal dunes and limestones at Bantamsklip

Satyrium carneum rooitrewwa on coastal limestones

Mesembryanthemum vanrensburgii seepampoen in rocky shore habitat – coastal and regional endemic

Erica coccinea vlakteheide on coastal limestone

Silene crassifolia on primary dunes

Gazania krebsiana gousblom with *Muraltia satureioides* (purple flowers) in coastal sand fynbos

Tetragonia decumbens kinkelbossie on primary dunes

c Floristic analysis

(i) Local analysis

MDS analysis of local floras is shown in Figure 4.2.10. As with the plot analysis, there is clear separation of floras on calcareous and non-calcareous soils, as is the association of pioneering habitats at the coast. The expected succession from primary to stable dunes is not apparent, and this is echoed in the vegetation analysis. However, there is a strong moisture gradient between drier and wetter acid sand floras and this explains the differences in communities on an otherwise relatively uniform substrate.

(ii) Subregional analysis

Cluster analysis of several subregional floras between Hermanus and Cape Agulhas (Figure 4.2.11) shows the Bantamsklip combined calcareous flora to be distinctive. Similarity with local sites is between 28% (Uilkraalmond) and 50% (Walker Bay). Although there is not a significant negative correlation between distance from Bantamsklip and decrease in species similarity, there is a definite trend which suggests this pattern. Of interest is that the Hermanus-Quoin Point coastline has a flora quite different (only 25% similarity) from that of the coastline in the vicinity of Cape Agulhas, and two flora centres can be recognised, both being part of the larger Agulhas Plain flora. Analysis of calcrete floras (only six could be found for the subregion), indicates a split between coastal (non-proteoid) and inland (proteoid) floras. Similarity between the two groups is only 15%.

(iii) Endemism

Very little detailed information on endemism in the flora of the Overberg-Agulhas region is available. At a very broad scale, the Agulhas Plain, into which the study site falls, is accorded its own phytogeographic centre (Weimarck, 1941; Goldblatt & Manning, 2000). Comparison of the Agulhas and Humansdorp floras (Cowling & Holmes, 1992) indicated a higher level of Cape endemics in the former as well as major compositional differences. The latter included a decline in typical Cape genera as one moved further east.

A summary of endemism at Bantamsklip, based upon the species distribution data in Appendix 4.2.3 is shown in Table 4.2.3. Endemism is fairly high for the site, with 10 regional, eight regional and habitat, six local and 10 local and habitat endemics, giving a total of 34 (Table 4.2.3). The highest number of endemics is found in the limestone fynbos, followed by fynbos on acid sand. Endemism is high for the Agulhas Plain (Cole *et al*., 2002), and seems to be particularly significant at Bantamsklip (Cowling *et al*., 1988; Cowling, 1996).

Again, virtually no specific research has been performed on the dune and related floras of the region. Euston-Brown's (2004) work does, however provide a glimpse of local flora composition, although confined to nature reserves along the coastline between Walker Bay and Waenhuiskrans. However, no contextualisation is provided for the flora, other than to state that out of a total of 460 indigenous species recorded, 75 were local and 130 Cape fynbos endemics. Work elsewhere in the Western Cape has indicated calcareous floras to be distinct, with major differences between calcareous dunes and inland acid sandy flats (Low, 2000; Low & Pond, 2006). Key reasons are the soil chemistry, with notable dominance of calcium (see above), mobility of the sandy substrate and proximity to the coast (*sensu* Daines & Low, 1993).

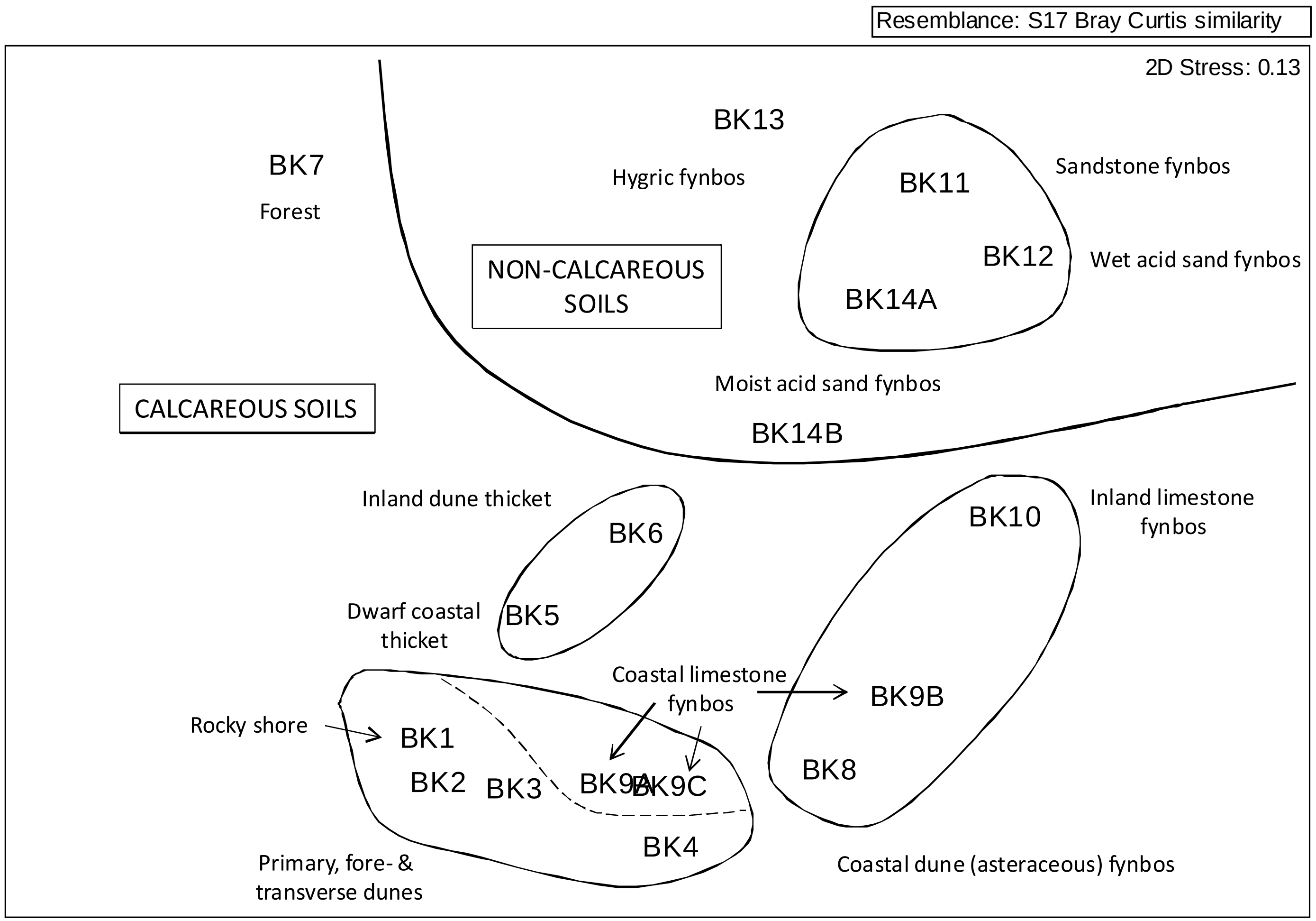


Figure 4.2.10. MDS analysis of terrestrial floras at Bantamsklip. Plant communities as per Table 4.2.2. There is a clear distinction between calcareous and non-calcareous substrates. The independent associations of primary and climax (mature) dune and limestone floras is apparent, as is the moisture gradient amongst communities on acid sand. Similarities at about 20 – 30%

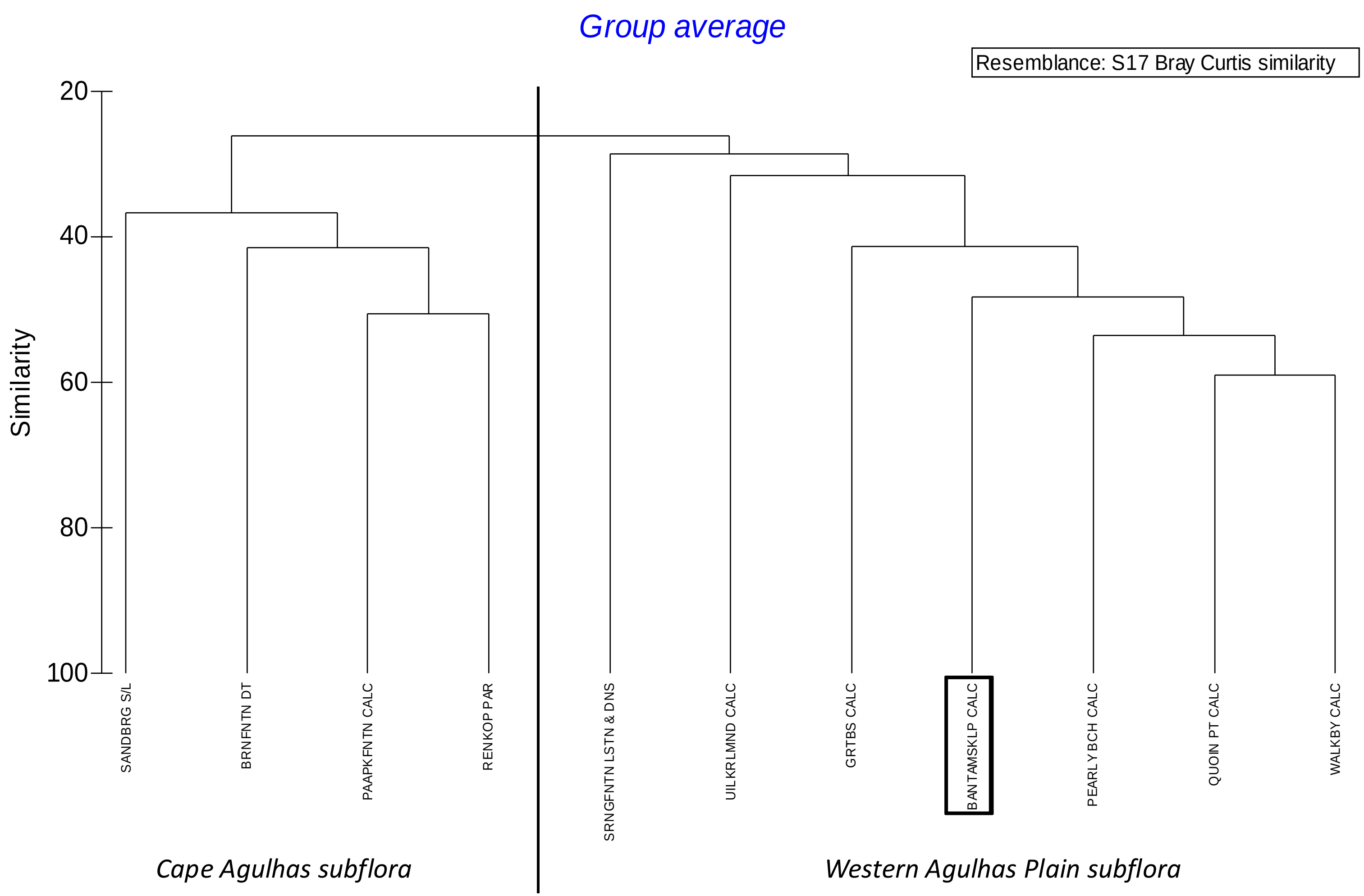


Figure 4.2.11. Cluster analysis of calcareous substrate floras from the coastline between Hermanus and Cape Agulhas. The separation of the regional flora into two centres (western Agulhas plain (including Bantamsklip) and Cape Agulhas) is clearly evident. Abbreviations explained in Appendix 4.2.4

Table 4.2.3. Endemics recorded from each community at Bantamsklip (summarised from species distribution data in Appendix 4.2.3). For description of plant communities see Table 4.2.2.

Site Label	Site description	Species Number				
		Regional endemics	Regional and habitat endemics	Local endemics	Local and habitat endemics	TOTAL
BK1	Rocky shore	0	0	0	0	0
BK2	Primary dunes	0	0	0	0	0
BK3	Foredunes	1	0	0	0	1
BK4	Transverse dunes	1	0	0	0	1
BK5	Dwarf coastal thicket	0	1	0	0	1
BK6	Inland thicket on calcareous sand	0	0	1	0	1
BK7	Forest on limestone	0	0	0	0	0
BK8	Coastal fynbos on deep sand	1	0	0	1	2
BK9	Coastal limestone fynbos	2	2	0	1	5
BK10	Inland limestone fynbos	1	5	1	5	12
BK11	Fynbos on sandstone	4	0	1	0	5
BK12	Wet fynbos on acid sand	3	2	2	2	9
BK13	Hygric fynbos on acid sand	0	1	1	0	2
BK14	Moist fynbos on acid sand	1	3	2	1	7
BK15	Wetland	0	1	0	0	1
BK16	Groot Hagelkraal River	1	1	0	0	2
Total		**10**	**8**	**6**	**10**	**34**

d Dune systems

Mapped dunes of the Bantamsklip site and approximately 120 km of coastline, from Hermanus to Cape Agulhas, are shown in Figure 4.2.12, with a more detailed map depicting dunes at Bantamsklip appearing in Figure 4.2.13. An aerial photo mosaic shows the location of transverse and deflated parabolic dunes (Figure 4.2.14). Dune type and system nomenclature is adapted from Tinley (1985), Low & Pond (2004) and Low & Pond (2006a & 2006b). Six dune types are found in the area (Table 4.2.4): dune sand over TMS (sandstone), dune sand over limestone, embryo (primary) dunes, parabolics, deflated parabolics (older, flattened versions of the younger parabolics) and transverse dunes. Parabolics (15 040 ha plus 1 320 deflated) comprise by far the highest proportion of dune types along this coastline, a total of 74% of the mapped area. Transverse types are the second largest by area (5 334 or 24.1%). Because of their narrow distribution immediately at the coast, embryo dunes are understandably low in extent. Walker Bay has the largest system, a parabolic-transverse complex, and there is an extensive deflated parabolic system at Cape Agulhas.

Bantamsklip possesses only 6.2% of the dune systems along this coastline, contributing a mere 2.9 and 3.3% respectively to the deflated parabolics and transverse dunes of the area. The deflated parabolics are well-represented between Bantamsklip and Cape Agulhas to the east and Walker Bay to the west (pers.obs.), mostly with good quality coastal sand fynbos (Cowling's (1996) Dune Asteraceous Fynbos). Correspondingly the transverse dunes at Bantamsklip are in poor condition, having been planted with invasive *Acacia cyclops* rooikrans. Again, larger systems, albeit infested with *A.cyclops* as well, are to found in the Walker Bay dunefields and also on the eastern boundary of Bantamsklip, at Soetfontein.

Table 4.2.4. Dune type and extent along the Bantamsklip & environs coastline. Areas determined from GIS coverage in Figure 4.2.12

Dune type	Area (subregion) (ha)	% of total	Area (Bantamsklip) (ha)	% of Bantamsklip	% Bantamsklip of subreg total
Dune sand over TMS	53.4	0.2	0.0	0.0	0.0
Dune sand over limestone	120.3	0.5	0.0	0.0	0.0
Embryo	263.3	1.2	10.6	0.8	<0.1
Parabolic	1 320.1	6.0	0.0	0.0	0.0
Parabolic – deflated	15 040.2	68.0	635.2	46.2	2.9
Transverse	5 334.0	24.1	727.9	53.0	3.3
Total	**22 131.3**	**100.0**	**1 373.7**	**100.0**	**6.2**

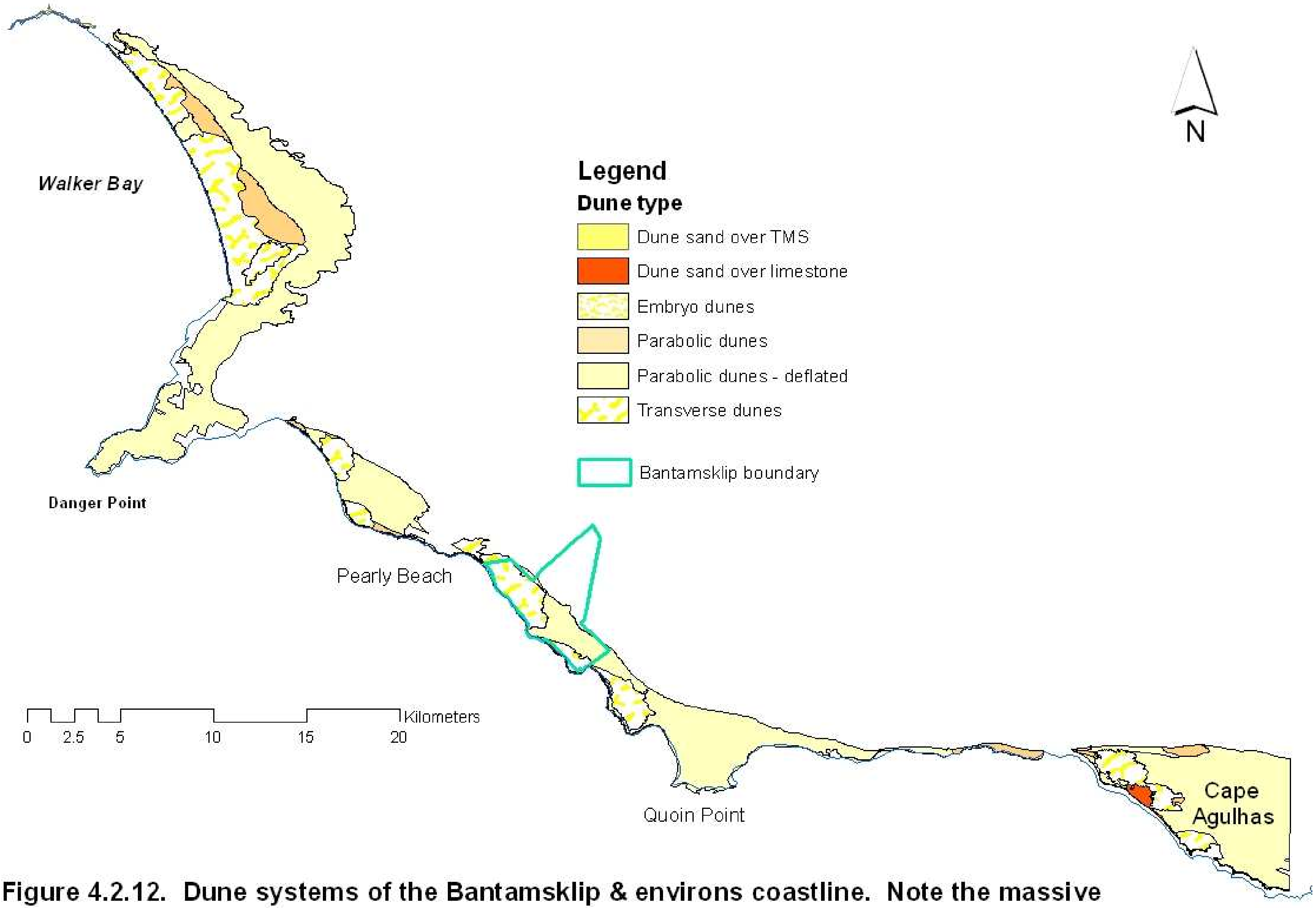


Figure 4.2.12. Dune systems of the Bantamsklip & environs coastline. Note the massive transverse-parabolic dune complex at Walker Bay and the narrowness of the system at Bantamsklip

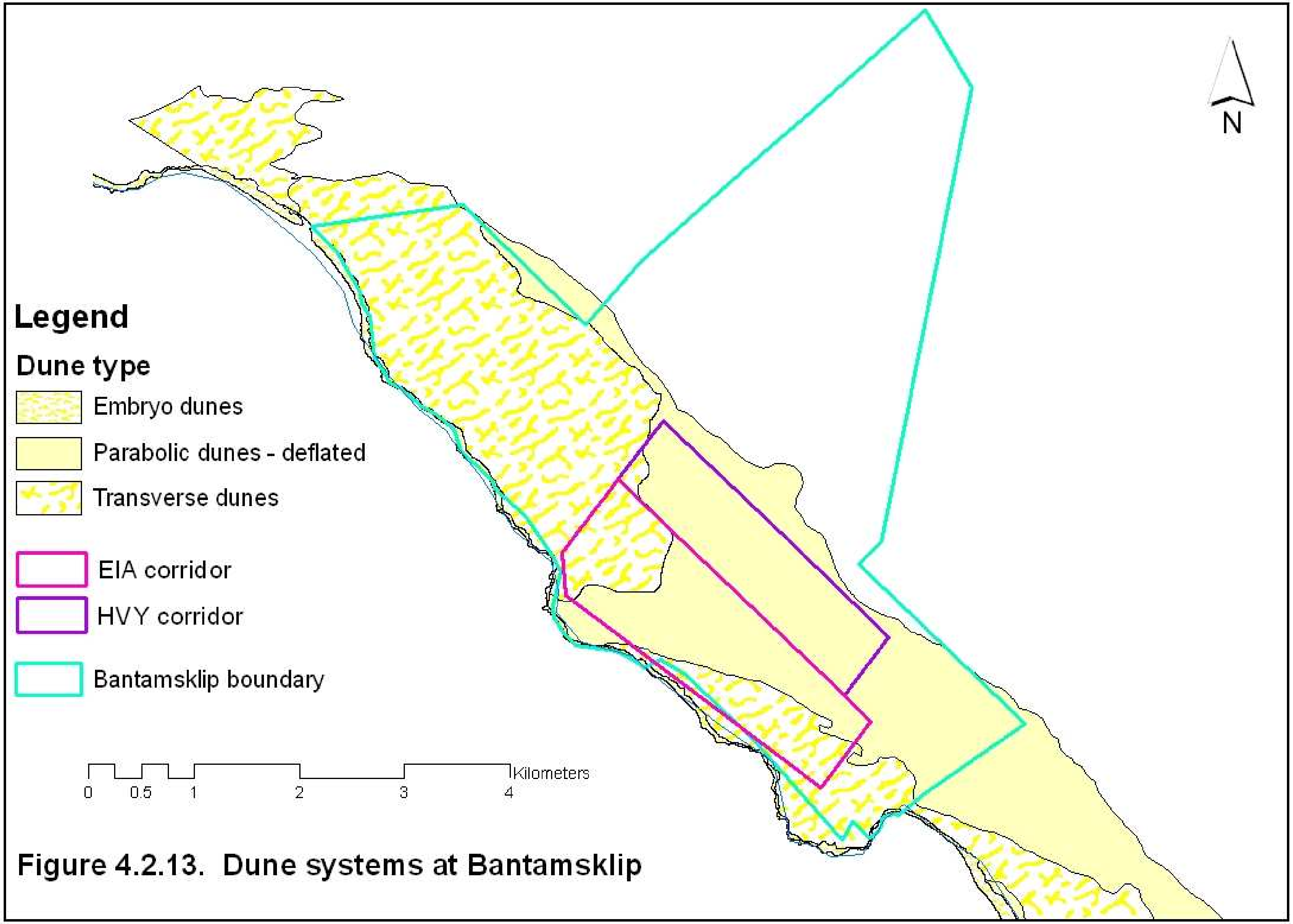


Figure 4.2.13. Dune systems at Bantamsklip

Figure 4.2.14. Aerial photographic mosaic of Bantamsklip showing transverse and parabolic dune systems

4.2.3 Rarity and sensitivity analysis

a Rarity

Rarity for the site is shown in Appendix 4.2.6, where vegetation type, habitat, and Red Data species (unweighted and weighted) are assessed – see Figure 4.2.15. Vegetation type rarity is on the whole low (*sensu* Rouget *et al*., 2004). Habitat rarity, which provides a far better reflection of rarity at the point scale, is highest for communities north of the R43. Both inland and coastal limestones rate high (Appendix 4.2.6, Figure 4.2.15).

Species rarity (unweighted) rates medium for the coastal sand fynbos and wet acid sand fynbos, but high for the limestones and moist acid sand fynbos (Figure 4.2.15). There is a great decline is weighted species rarity south of the Gansbaai road, with the northern parts generally ranking medium or high. Total species rarity for the site (Table 4.2.5) is 50 species (10.8%), with one critically threatened (*Lampranthus tenuifolius*) and ten Endangered species (*Agathosma haelkraalensis, Aspalathus tylodes, Diosma haelkraalensis, Hypodiscus procurrens, Leucospermum heterophyllum* rankluisie, *Mimetes saxatilis* rooistompie, *Phylica amoena* and *Spatalla ericoides*), found on the site. Significantly, 18 species are in the Proteaceae family (proteas).

Overall rarity (Figure 4.2.16), which presents a total, weighted value, for rarity across the site (see Appendix 4.2.5), indicates highest rarity for the inland limestone fynbos and acid sand fynbos, with only the coastal limestones rating as medium for the southern part of the site (Figure 4.2.16).

b Sensitivity

Of the four criteria assessed for site sensitivity, erosion potential is greatest on the coastal dunes, and susceptibility to fire highest amongst the fynbos communities (Appendix 4.2.7, with data obtained from Appendix 4.2.5) – see Figure 4.2.17. Resilience is low for several of the coastal systems, medium for both coastal and inland limestones and very low for the river (Figure 4.2.17). Overall weighted sensitivity (Figure 4.2.18) is medium for most of the site, with all the limestones rating high (data obtained from Appendix 4.2.5). Whilst perhaps not as important as rarity for guiding development at Bantamsklip, sensitivity does provide clear indications for management and conservation prerogatives, such as fire and erosion control, and this should be included in the EMP.

4.2.4 Conservation

A number of conservation assessments has been conducted for the Cape flora. Conservation importance for the northern part of the Bantamsklip site is extremely high (Figure 4.2.19; Cowling *et al*., 1999), with most of the site recorded as totally or at least 60 – 80% irreplaceable. Low (2003) on the other hand rates the site much lower for ecological importance, with the northern area receiving 40 – 80%, and the southern parts 40 – 60%.

In a much more detailed study focusing on the Agulhas Plain, Cole *et al*. (2000) indicate slightly lower values for irreplaceability, although the coast is rated more highly and there is a corridor between the latter and inland. CapeNature manages a number of reserves along this coast, at Walker Bay, Uilkraalmond, Pearly Beach and Quoin Point. The Pearly Beach Nature Reserve, which *de facto* protects the south-western part of the Bantamsklip site, apparently is not a formal conservation area under the Province but is managed by CapeNature (Gert Greeff, pers.comm., October 2007). Groot Hagelkraal Farm is a Private Nature Reserve and Natural Heritage Site.

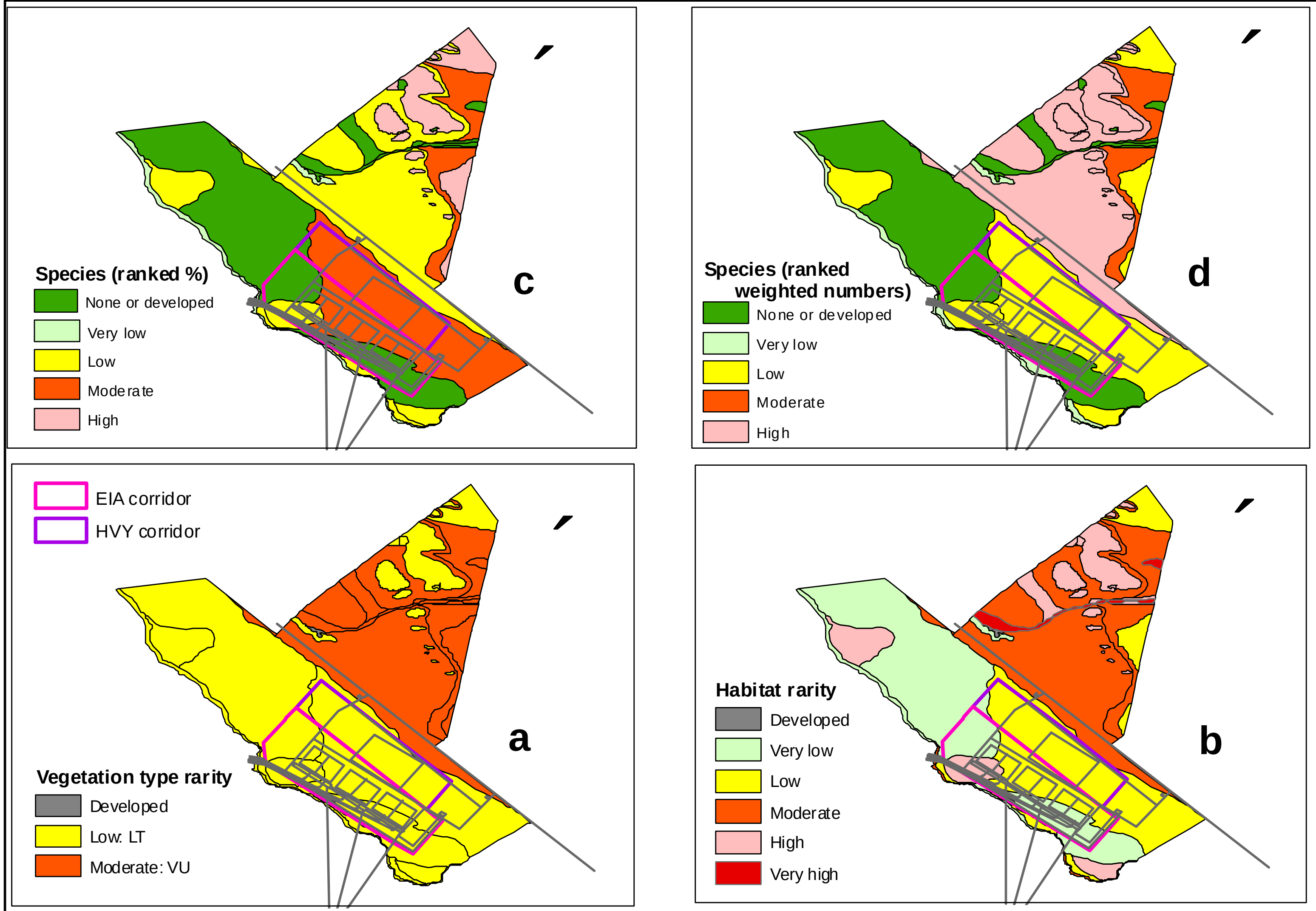


Figure 4.2.15. Rarity at Bantamsklip, showing position of nuclear power station footprints. a: vegetation type; b: habitat; c: species (%); d: species (weighted numbers). Rarity calculated from values in Appendix 4.2.5

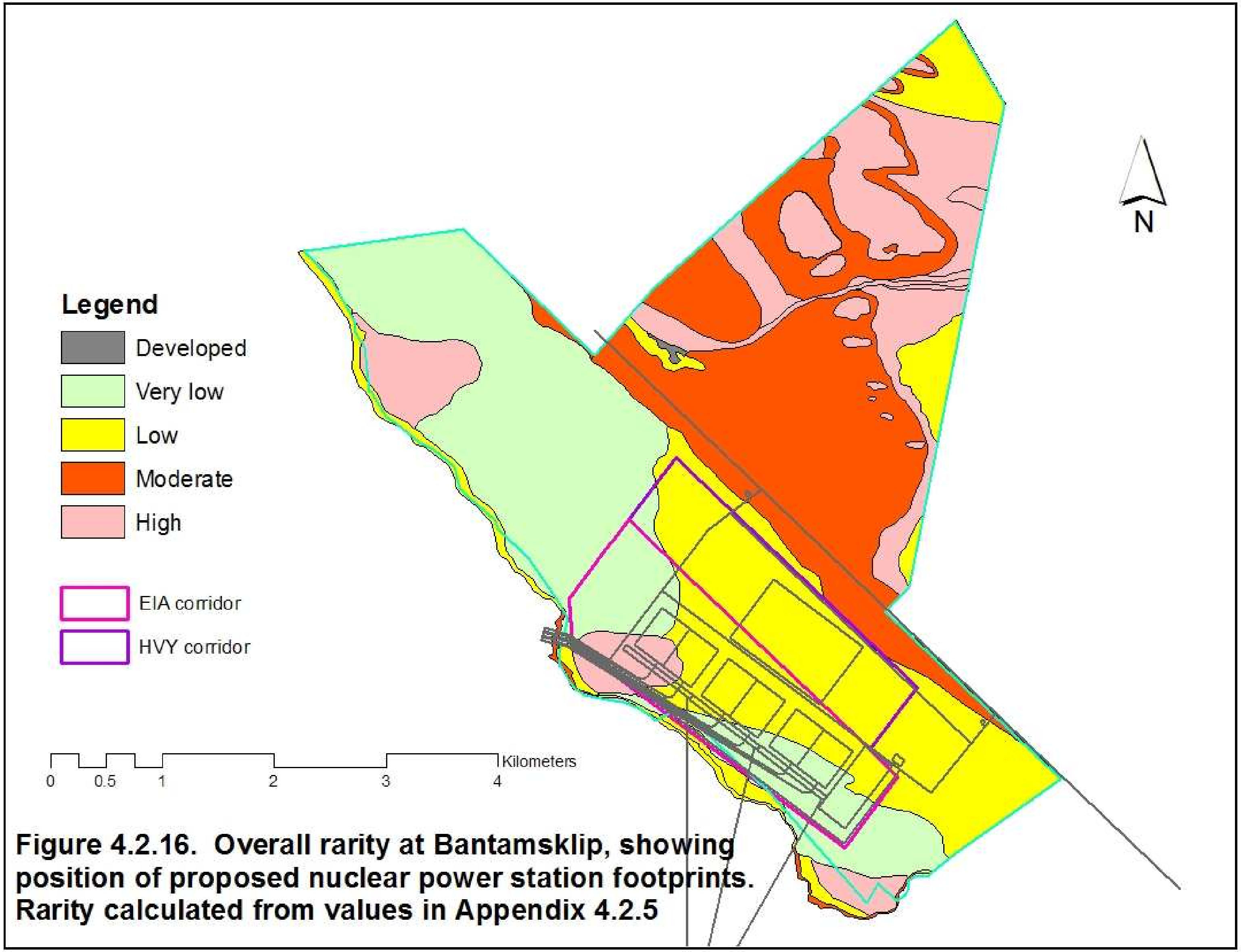


Figure 4.2.16. Overall rarity at Bantamsklip, showing position of proposed nuclear power station footprints. Rarity calculated from values in Appendix 4.2.5

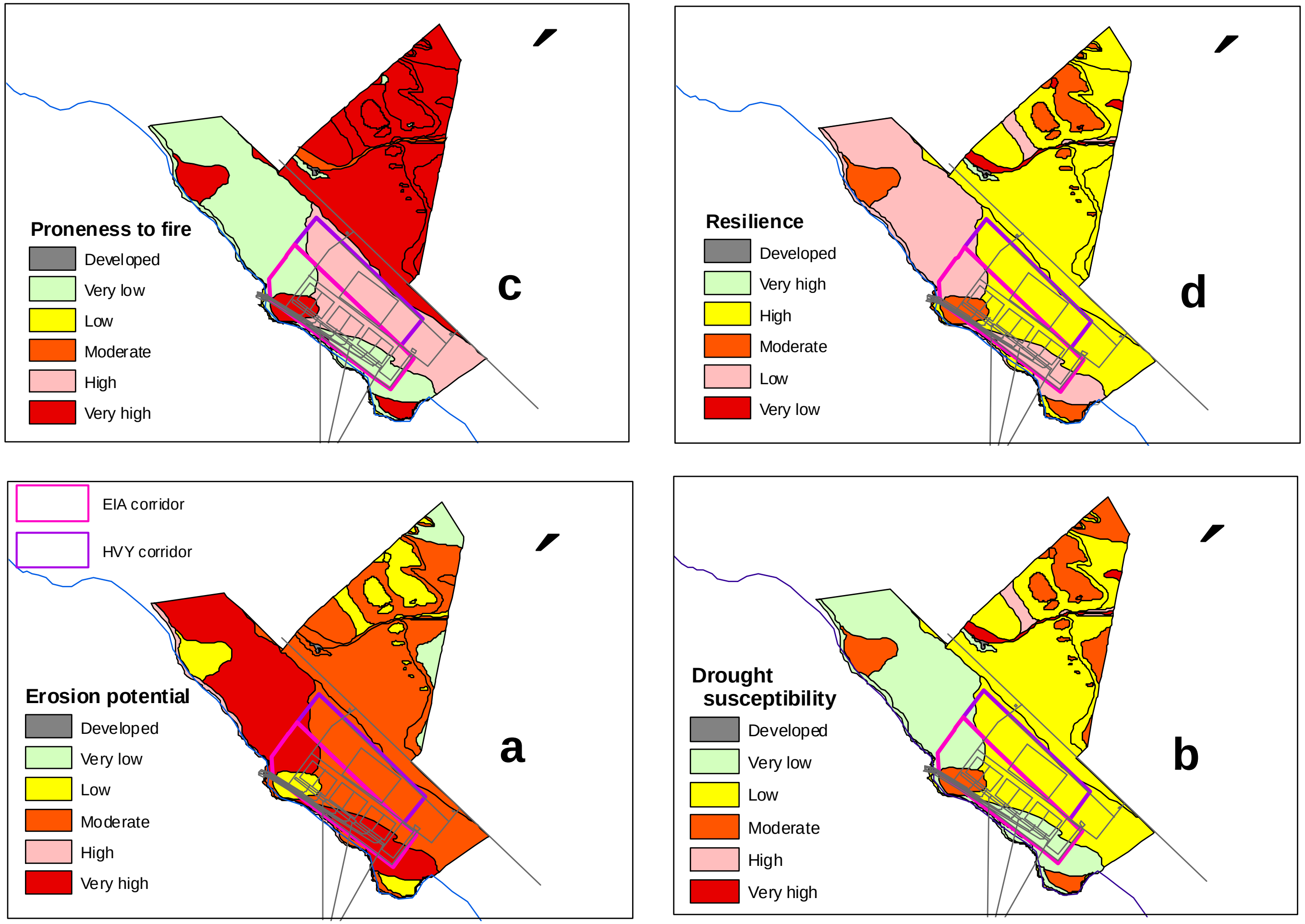


Figure 4.2.17. Ecological sensitivity at Bantamsklip, showing proposed nuclear power station footprints. a: erosion potential; b: susceptibility to droughting; c: proneness to fire; d: plant community resilience. Sensitivity calculated from values in Appendix 4.2.5

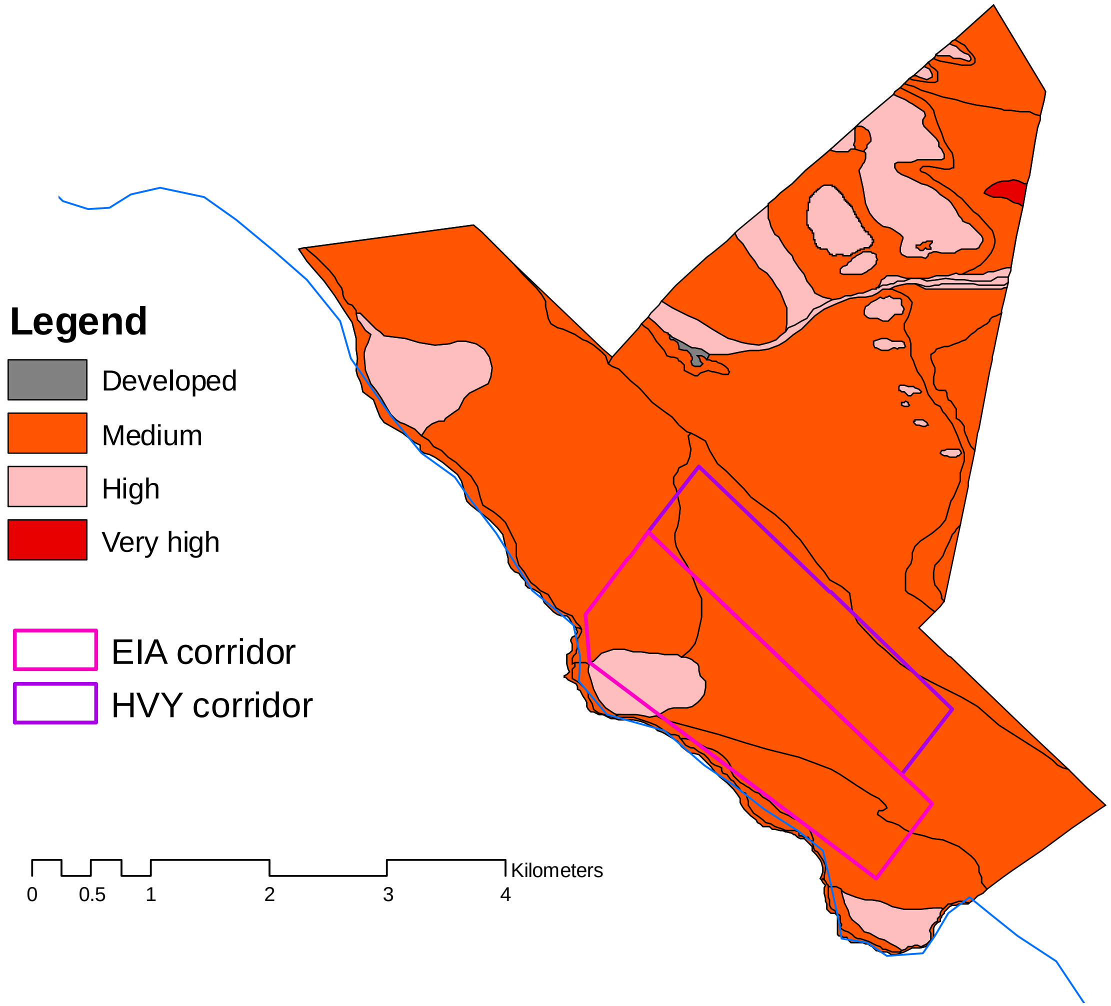


Figure 4.2.18. Overall sensitivity at Bantamsklip, showing proposed nuclear power station footprints. Sensitivity calculated from values in Appendix 4.2.5

Table 4.2.5. Red Data species recorded from Bantamsklip. From Raimondo *et al*., 2009)

Family	Species	Current red data status	Plant community	Site description
Division: Anthophyta	**Class**: Dicotyledones			
APIACEAE	*Capnophyllum africanum*	NT	BK5	Dwarf coastal thicket
ASTERACEAE	*Helichrysum cochleariforme*	NT	BK5 BK8 BK9	Dwarf coastal thicket Fynbos on deep sand over limestone Coastal limestone fynbos
ASTERACEAE	*Metalasia umbelliformis*	VU	BK10	Fynbos on limestone
ASTERACEAE	*Senecio pillansii*	NT	BK9	Coastal limestone fynbos
CAMPANULACEAE	*Roella arenaria*	VU	BK14	Moist acid sand fynbos
ERICACEAE	*Erica calcareophila*	VU	BK10	Fynbos on limestone
ERICACEAE	*Erica occulta*	VU	BK10	Fynbos on limestone
FABACEAE	*Aspalathus tylodes*	EN	BK12	Fynbos on acid sand
FABACEAE	*Psoralea repens*	NT	BK2 & BK3 BK9	Primary and foredunes Coastal limestone fynbos
FABACEAE	*Xiphotheca fruticosa*	VU	BK12	Fynbos on acid sand
MESEMBRYANTHEMACEAE	*Lampranthus ceriseus*	VU	BK10	Fynbos on limestone
MESEMBRYANTHEMACEAE	*Lampranthus fergusoniae*	VU	BK8 BK9	Fynbos on deep sand over limestone Coastal limestone fynbos
MESEMBRYANTHEMACEAE	*Lampranthus tenuifolius*	CR	BK14	Moist acid sand fynbos
MESEMBRYANTHEMACEAE	*Mesembryanthemum vanrensburgii*	NT	BK1	Rocky Shore
PROTEACEAE	*Aulax pallasia*	NT	BK11	Fynbos on sandstone
PROTEACEAE	*Aulax umbellata*	NT	BK14	Moist acid sand fynbos
PROTEACEAE	*Leucadendron coniferum*	VU	BK6 BK14	Thicket on calcareous sand Moist acid sand fynbos
PROTEACEAE	*Leucadendron linifolium*	VU	BK14	Moist acid sand fynbos
PROTEACEAE	*Leucospermum cordifolium*	NT	BK11	Fynbos on sandstone
PROTEACEAE	*Leucospermum heterophyllum*	EN	BK11	Fynbos on sandstone
PROTEACEAE	*Leucospermum hypophyllocarpodendron subsp. hypophyllocarpodendron*	VU	BK14	Moist acid sand fynbos
PROTEACEAE	*Leucospermum patersonii*	VU	BK10	Fynbos on limestone
PROTEACEAE	*Leucospermum trunculatum*	NT	BK11	Fynbos on sandstone

Table 4.2.5 (contd.)

Family	Species	Current red data status	Site Label	Site description
PROTEACEAE	*Mimetes saxatilis*	EN	BK10	Fynbos on limestone
PROTEACEAE	*Protea compacta*	NT	BK11 BK12 BK14	Fynbos on sandstone Fynbos on acid sand Moist acid sand fynbos
PROTEACEAE	*Protea longifolia*	VU	BK11	Fynbos on sandstone
PROTEACEAE	*Protea obtusifolia*	NT	BK10 BK12 BK14	Fynbos on limestone Fynbos on acid sand Moist acid sand fynbos
PROTEACEAE	*Protea susannae*	NT	BK12 BK14	Fynbos on acid sand Moist acid sand fynbos
PROTEACEAE	*Serruria elongate*	NT	BK11	Fynbos on sandstone
PROTEACEAE	*Serruria fasciflora*	NT	BK11	Fynbos on sandstone
PROTEACEAE	*Serruria nervosa*	NT	BK12	Fynbos on acid sand
PROTEACEAE	*Spatalla curvifolia*	NT	BK11	Fynbos on sandstone
PROTEACEAE	*Spatalla ericoides*	EN	BK12 BK14	Fynbos on acid sand Moist acid sand fynbos
RHAMNACEAE	*Phylica amoena*	EN	BK12	Fynbos on acid sand
RUTACEAE	*Agathosma geniculata*	NT	BK8	Fynbos on deep sand over limestone
RUTACEAE	*Agathosma haelkraalensis*	E	BK10	Fynbos on limestone
RUTACEAE	*Diosma awilana*	VU	BK8 BK10	Fynbos on deep sand over limestone Fynbos on limestone
RUTACEAE	*Diosma haelkraalensis*	EN	BK10	Fynbos on limestone
SANTALACEAE	*Osyris speciosa*	VU	BK10 BK12 BK14	Fynbos on limestone Fynbos on acid sand Moist acid sand fynbos
SCROPHULARIACEAE	*Jamesbrittenia calciphila*	NT	BK10	Fynbos on inland limestone
SCROPHULARIACEAE	*Manulea caledonica*	NT	BK8	Fynbos on deep sand over limestone
SCROPHULARIACEAE	*Selago diffusa*	VU	BK9	Coastal limestone fynbos
ZYGOPHYLLACEAE	*Roepera fuscata*	VU	BK5	Dwarf coastal thicket

Table 4.2.5 (contd.)				
Division: Anthophyta	**Class:** Monocotyledones			
ASPARAGACEAE	*Asparagus stipulaceus*	NT	BK8	Fynbos on deep sand over limestone
			BK9	Coastal limestone fynbos
CYPERACEAE	*Tetraria brachyphylla*	NT	BK8	Fynbos on deep sand over limestone
IRIDACEAE	*Gladiolus variegatus*	VU	BK10	Fynbos on limestone
			BK14	Moist acid sand fynbos
ORCHIDACEAE	*Satyrium carneum*	NT	BK5	Dwarf coastal thicket
			BK6	Inland thicket on calcareous sand
			BK8	Fynbos on deep sand over limestone
			BK9	Coastal limestone fynbos
			BK10	Inland limestone fynbos
			BK14	Moist acid sand fynbos
RESTIONACEAE	*Hypodiscus procurrens*	EN	BK6	Thicket on calcareous sand
RESTIONACEAE	*Thamnochortus fraternus*	NT	BK10	Fynbos on limestone
			BK9	Coastal limestone fynbos
RESTIONACEAE	*Thamnochortus pellucidus*	VU	BK11	Fynbos on sandstone
			BK12	Fynbos on acid sand

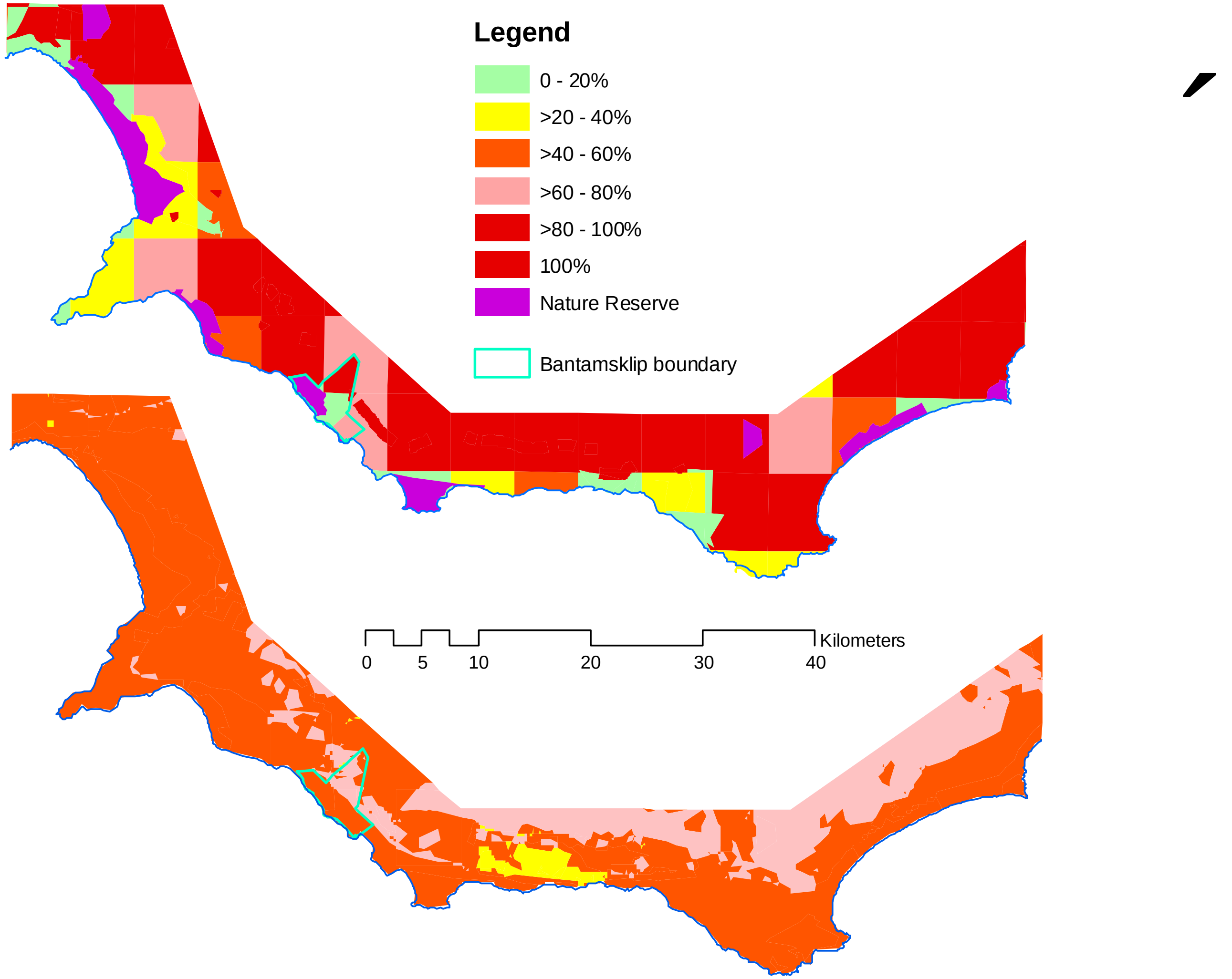


Figure 4.2.19. Irreplaceability (Cowling et al., 1999) (top) and ecological importance (Low, 2003) (bottom) for the Bantamsklip & environs coastal area

4.3 Thyspunt

4.3.1 Background and general description

The site is underlain by alternating bands of unconsolidated calcareous Quaternary sands (Toerien, 1984; Toerien & Hill, 1989) of the Witsand Formation (Coenie de Beer, pers.comm., 2007; *sensu* Theron *et al*., 1992) and consolidated aeolianite of the Nanaga Formation (Toerien, 1984). At the coast, quartzitic sandstone of the Skurweberg Formation (Toerien, 1984) is exposed. Further inland, the narrow northern boundary of the site also extends into quartzitic sandstone (Toerien, 1984) (Figure 4.3.1).

Based on the geology, soils fall within two broad groups. Shallow to deep calcareous sands (Fernwood Form, old Langebaan Series[4]) (Cowling, 1983) occur on the Quaternary sediments. Locally dunes sands overly a calcrete pan (Cowling, 1983) which restricts drainage. Here Fernwood (old Soetvlei Series) and Longland Soil Forms dominate. Shallow sands over calcrete are Mispah Form (old Kalkbank Series) (Cowling, 1983). On sandstone, soils are generally residual due to gentle slopes, and are acid and infertile, showing a range in depth. Shallow profiles are again of the Mispah Form, with the Cartref Form (Amabele Series) (Cowling, 1983) preferring gentle slopes and rounded ridges.

The geomorphology of the site is dominated by a headland bypass dune system (La Cock & Burkinshaw, 1996) - claimed by Tinley (1985) to be the most spectacular in South Africa - running west to east, inland of the small peninsulas of Seal Point and Cape St. Francis, to the east of the site boundary. Dunes form a series of parallel strips lying between Slangbaai (Oyster Bay) and Krom River, a distance of some 18 km. They are responsible for maintaining the long-term down drift of sand along the coast, with sand originating at one point and feeding a bay (St. Francis Bay in this case) across a headland (Tinley, 1985). These dunes have created an undulating landscape ranging from sea level to about 100 m amsl. Dune ridges alternate with broad to narrow slacks (valleys). In the north, the sandstone topography slopes gently in a northerly direction, from about 100 m to 160 m amsl. Dunes are chiefly of the hairpin parabolic deflation type (Tinley, 1985), overriding vegetated hairpin parabolics. Locally, a moving sand sea comprising largely transverse and barchanoid dunes (Tinley, 1985, La Cock & Burkinshaw, 1996) is found, lying parallel to the wind-rift system. Just inland of Algoa Bay, a mobile system of 120 km^2 is believed to have permitted the evolution of a number of endemic animal species (Callan, 1964; McLachlan *et al*., 1982). As with the Namaqualand coast, transverse dunes tend to be the result of a reworked parabolic system (Tinley, 1985, and see below).

[4] Soil Series (MacVicar *et al*., 1977) have been replaced with Soil Families as the soils series often caused uniform soil bodies to be split artificially by class boundaries. “For this reason, and because the information needed to define series classes to accommodate similar, more or less uniform soil bodies is not generally available, the series category has been omitted from the first edition. Consequently, the family, a higher category than the series, has become the lowest category in this, the second edition of the soil classification system” (MacVicar, 1991)

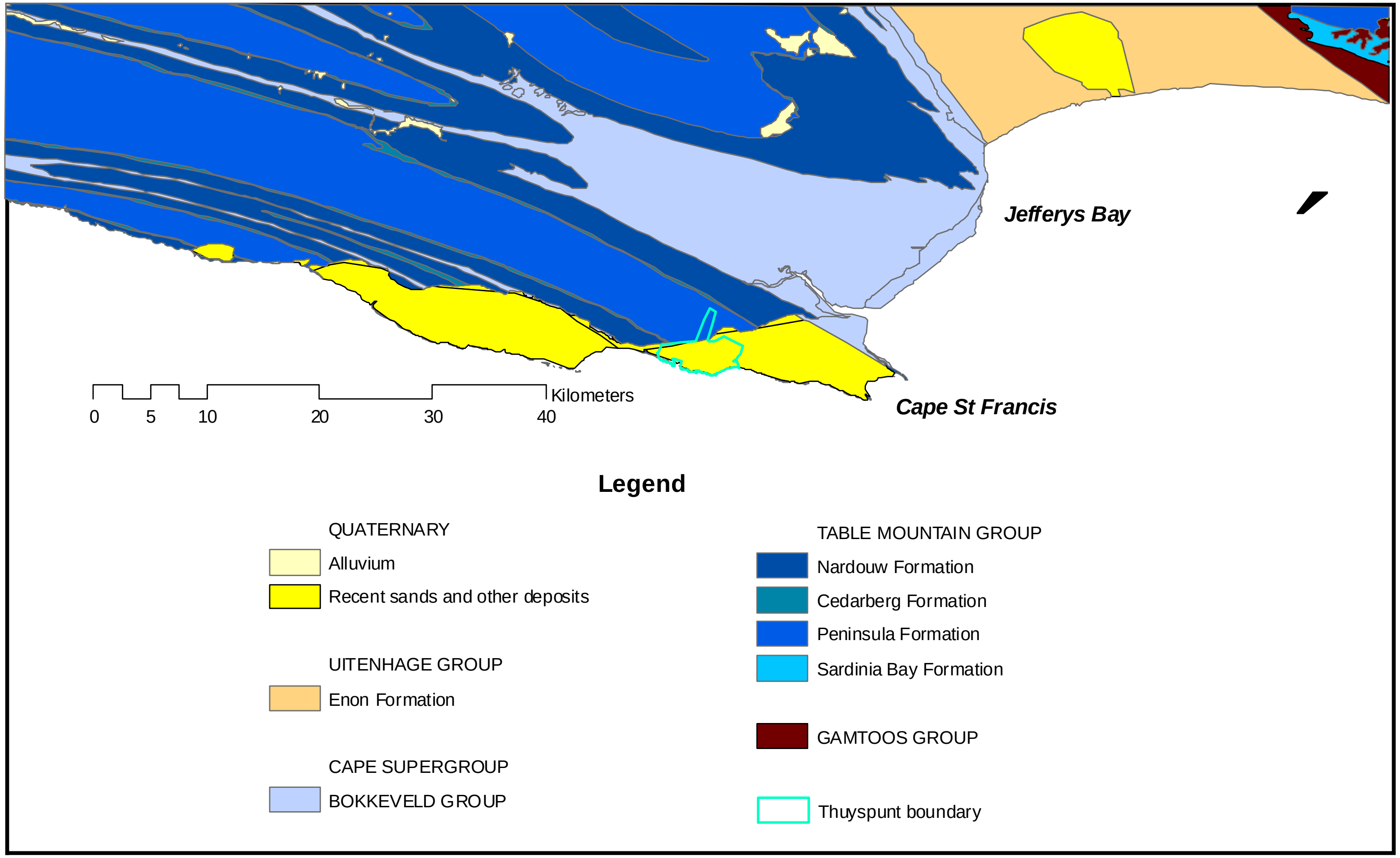


Figure 4.3.1. Geology of Thyspunt & environs. Summarised from Toerien (1984) and Toerien & Hill (1984)

Five major vegetation types are found in the general study area (*sensu* Mucina & Rutherford, 2006) (Figure 4.3.2). Two of these (threatened status in parentheses – see Rouget *et al*., 2004) - Algoa Dune Strandveld (Least Threatened - LT) (and Southern Cape Dune Fynbos (LT) - are confined to calcareous substrates, whilst the azonal Cape Seashore Vegetation (LT) is located on both calcareous sands and sandstone at the coast. In the north, Tsitsikamma Sandstone Fynbos (Vulnerable - V) occurs on quartzitic sandstone and there is a narrow band of Eastern Coastal Shale Band Vegetation (Endangered - E) just outside the site. Cowling (undated)[5] has mapped seven broad communities, which are little more than vegetation types (Figure 4.3.3). However he does include forest and thicket (omitted for this area by Mucina & Rutherford, 2006), although one might argue that Algoa Dune Strandveld is a Thicket type and should therefore be covered in Mucina & Rutherford, 2006). Indeed, Cowling (1984) refers to the vegetation of the site as a South Coast Dune Fynbos-Kaffrarian Thicket mosaic and this perhaps provides a more appropriate representation of the resident vegetation, although at a small scale.

A further, albeit undifferentiated, community, is that of wetlands which lie along the dune slacks in the centre of the site (Cowling, undated). These are all located on calcareous substrates and no doubt occur due to impeded drainage over calcrete and aeolianite.

The site is heavily infested by woody aliens, notably *Acacia cyclops* rooikrans and *A.saligna* Port Jackson willow. An extensive clearing programme is underway, being managed by Eskom (Gert Greeff, pers.comm).

[55] All attempts to locate Prof Richard Cowling's earlier report (?1988-1989) on the botany of the Thyspunt area were unsuccessful. Nevertheless, an electronic copy of his vegetation shape file was traced and has been used in this report.

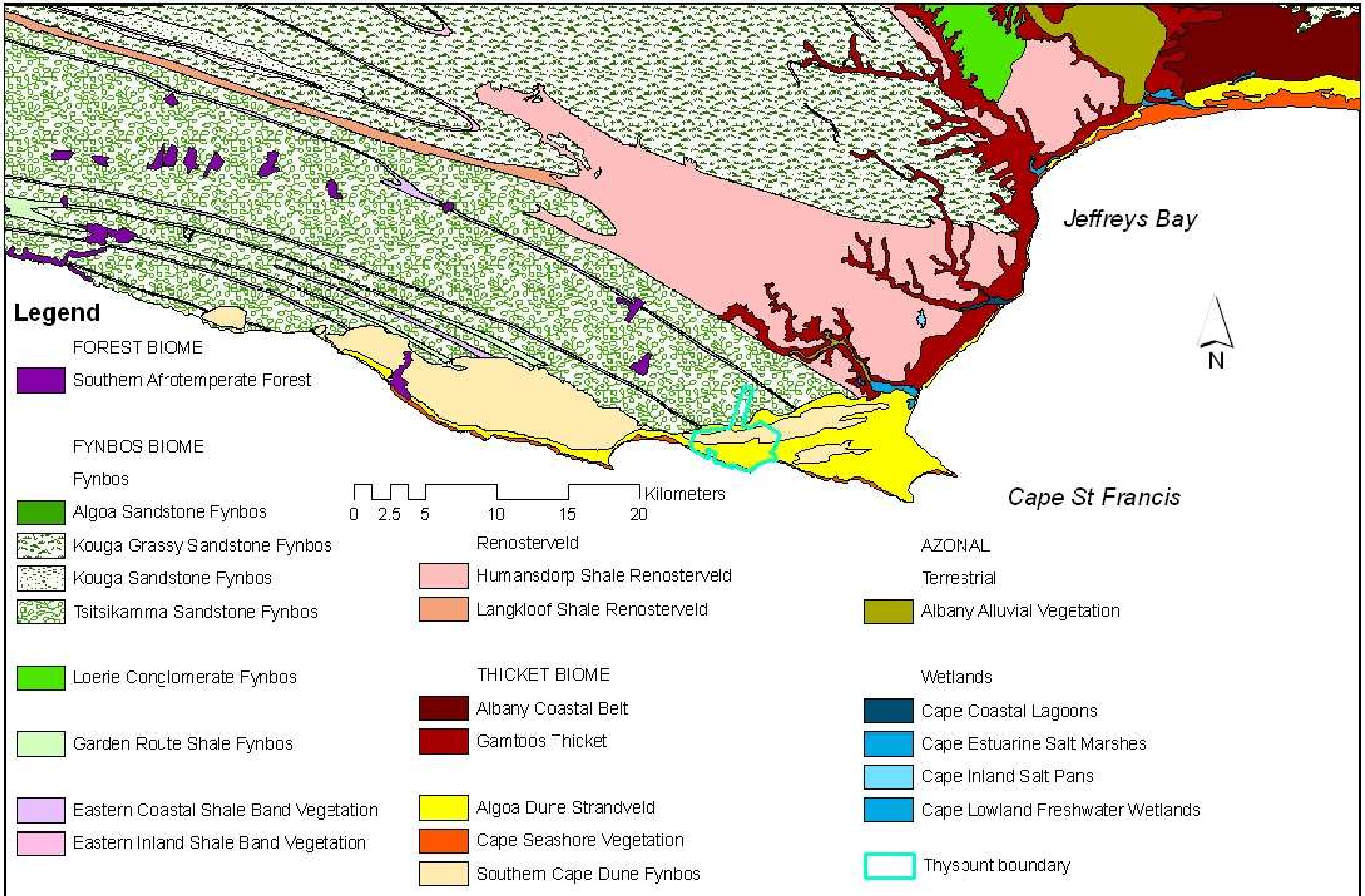


Figure 4.3.2. Vegetation types of Thyspunt & environs after Mucina & Rutherford (2006); biomes after Low & Rebelo (1998) and Mucina & Rutherford (2006)

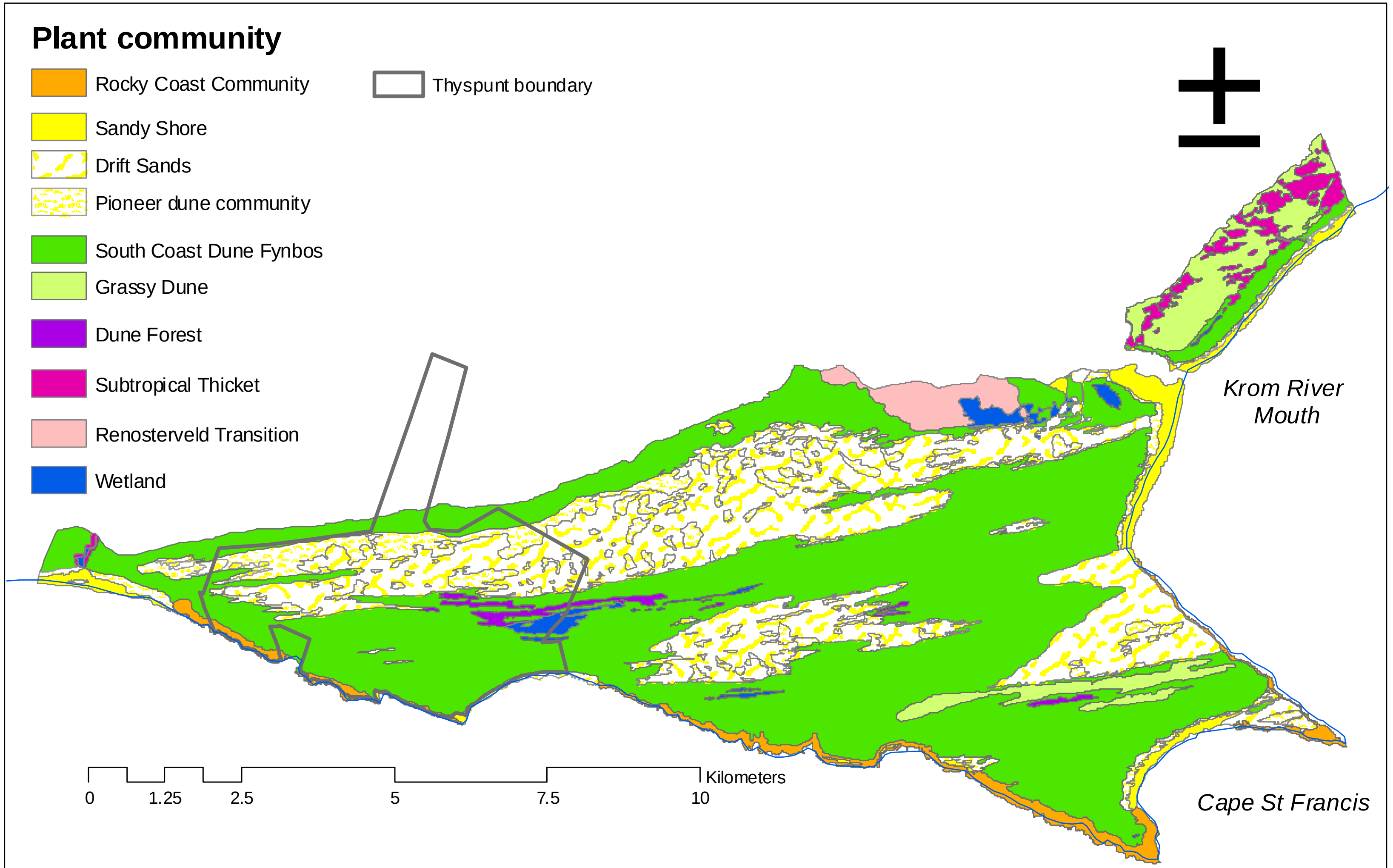


Figure 4.3.3. Plant communities of the Humansdorp coastal plain in relation to Thyspunt (after Cowling, undated). Note dominance of dune & grassy fynbos (parabolic dunes) and pioneer dune communities (transverse and primary dunes)

4.3.2 Findings & discussion

a Soils

Soils data appear in Table 4.3.1. Major differences amongst soils are in pH, calcium and total phosphorus. This is clearly illustrated in the MDS analysis in Figure 4.3.4, in which calcareous and non-calcareous substrates are separated, with dune sands on the left and acid sands on the right of the figure. Accumulation of organic matter plays a strong role as well, with marked increases in total carbon and total nitrogen, for example in the thicket (T5), forest (T6) and wetland (T2F).

Table 4.3.1. Analysis of selected soils from Thyspunt

Sample no.	pH	Resistance (Om)	Total P (mg/kg)	Bray no.2 P (mg/kg)	Exchangeable cations (cmol/kg)				Total N (%)	Total C (%)	CEC (cmol/kg)
					Na	K	Ca	Mg			
Terrestrial											
T1/1	7.8	790	305.5	14	0.56	0.22	17.51	3.06	0.126	0.97	3.94
T3/1	7.9	4120	418.7	60	0.07	0.04	16.82	0.58	0.092	0.86	3.09
T3/2	8.6	6010	389.5	24	0.06	0.04	15.28	0.22	0.027	0.09	1.19
T5/1	6.4	730	1191.3	160	1.10	0.68	23.08	14.20	0.527	10.10	44.56
T6/1	6.7	580	1627.8	192	1.55	1.17	57.17	11.16	1.503	8.86	13.78
T7B/1	7.5	1300	706.3	193	0.29	0.28	17.00	2.35	0.208	1.81	4.73
T7C/1	7.6	2180	1014.2	88	0.11	0.09	18.16	0.73	0.149	1.26	3.54
T7D/1	8.2	3900	421.7	18	0.11	0.04	15.68	0.29	0.045	0.11	1.90
T8/1	7.6	1110	773.7	109	0.38	0.33	22.04	3.32	0.441	2.37	5.72
T9/1	4.6	2760	86.3	18	0.22	0.29	2.52	1.22	0.153	1.90	3.54
Wetland											
T10A/1	7.6	630	500.9	137	1.25	0.30	102.75	3.96	0.157	1.48	4.60
T10A/2	7.7	660	1184.7	14	0.74	0.49	30.17	5.59	0.420	3.99	9.76
T10B/1	7.4	330	637.1	2	1.63	0.58	48.35	3.78	0.927	2.04	8.95
T10B/2	7.4	480	600.5	2	1.09	0.52	38.56	2.77	0.630	2.09	24.34
T10C/1	8.6	2830	438.3	20	0.09	0.07	15.98	0.25	0.039	0.09	1.64
T10D/1	5.3	1500	110.2	11	0.47	0.24	8.53	3.01	0.302	4.60	8.02
T10E/1	8.8	3240	554.2	13	0.10	0.02	15.11	0.27	0.029	0.11	1.29
T10F/1	5.4	440	698.5	27	1.88	1.27	20.58	11.15	0.931	12.10	29.13

pH – measured in 1M KCl; P – phosphorus; Na – sodium; K – potassium; Ca – calcium; Mg – magnesium; N – nitrogen; C - carbon

b Flora & vegetation

Individual species lists for Thyspunt are shown in Appendix 4.3.1, with a composite list appearing in Appendix 4.3.2. Species numbers for the various sites are discussed below. The total species complement for the site is 383. Dominant families are the Asteraceae (daisies) (60), Cyperaceae (sedges), Fabaceae (peas) (both 20), Poaceae (grasses) (17) and Scrophulariaceae (snapdragons) (11 species). Total species rarity is low relative to other coastal sites (Low, unpub.; SaSFlora, 1998 – 2011) (14 species or 3.7%). Species rarity is discussed in greater detail below, under the site rarity assessment.

Mapped plant communities, including plot locations, are shown in Figure 4.3.5, with a brief description of communities and a summary of species data in Table 4.3.2. Due to difficulties of access (much of the site was heavily infested by woody alien acacias) and major time constraints on the study, several plots were recorded outside the Thyspunt boundary, but in vegetation representative of that occurring within the study site. Figure 4.3.6 shows images of the major plant communities. Images of several key species encountered in the study are shown in Plates 4.3.1 and 4.3.2.

In general pioneering communities (T1 and T2) are found at the coast, but also inland on the mobile and semi-mobile transverse dunes (T3). Most of the site comprises stable parabolic and deflated parabolic dunes which largely support thicket (T4, T5), forest (T6) and dune fynbos (T7) communities. Two other forms of fynbos are encountered: on limestones a distinct type (T8) is found which is extremely localised, and on sandstone to the north (T9). Some six wetland suites are also found, with only two being represented on the map. In the specialist wetland report by the Fresh Water Consulting Group, all wetlands are accurately mapped.

MDS analysis of plot data appears in Figure 4.3.7. Communities show clear separation into forest and tall thicket, dwarf thicket, dune fynbos, rocky shore and limestone, transverse dunes, and sandstone fynbos. Vegetation similarity and dissimilarity is discussed in more detail under the respective communities below.

(i) Calcareous sands and limestones

Rocky shore (Community T1) (Plate 4.3.3)

Synonyms: Cowling (undated) – Rocky Coast community; Mucina & Rutherford (2006) – Cape Seashore Vegetation.

This community (see map in Figures 4.3.5 & 4.3.6) is located immediately above the high-water mark, and is, in essence, closely associated with the primary dunes discussed below. It is found largely on thin, windblown sand over an ancient platform cut by waves in the underlying sandstone. Dune formation is either minimal or non-existent. Plant cover is generally fairly high, but plants are kept short by on-shore winds and salt spray. Key species include: *Carpobrotus deliciosus* sour fig, *Chrysanthemoides monilifera* bietou*, Crassula nudicaulis* skraalplakkie, *Felicia echinata* bloublommetjie, *Ficinia lateralis* dune sedge, *Helichrysum teretifolium, Maytenus procumbens* duinekokoboom, *Metalasia muricata* blombos, *Olea capensis* subsp. *capensis* ysterhout, *Osyris compressa* Cape sumach, *Passerina rigida* duinegonnabas, *Phylica litoralis, Rhus crenata* duinekraaibessie and *Stenotaphrum secundatum* buffalo grass.

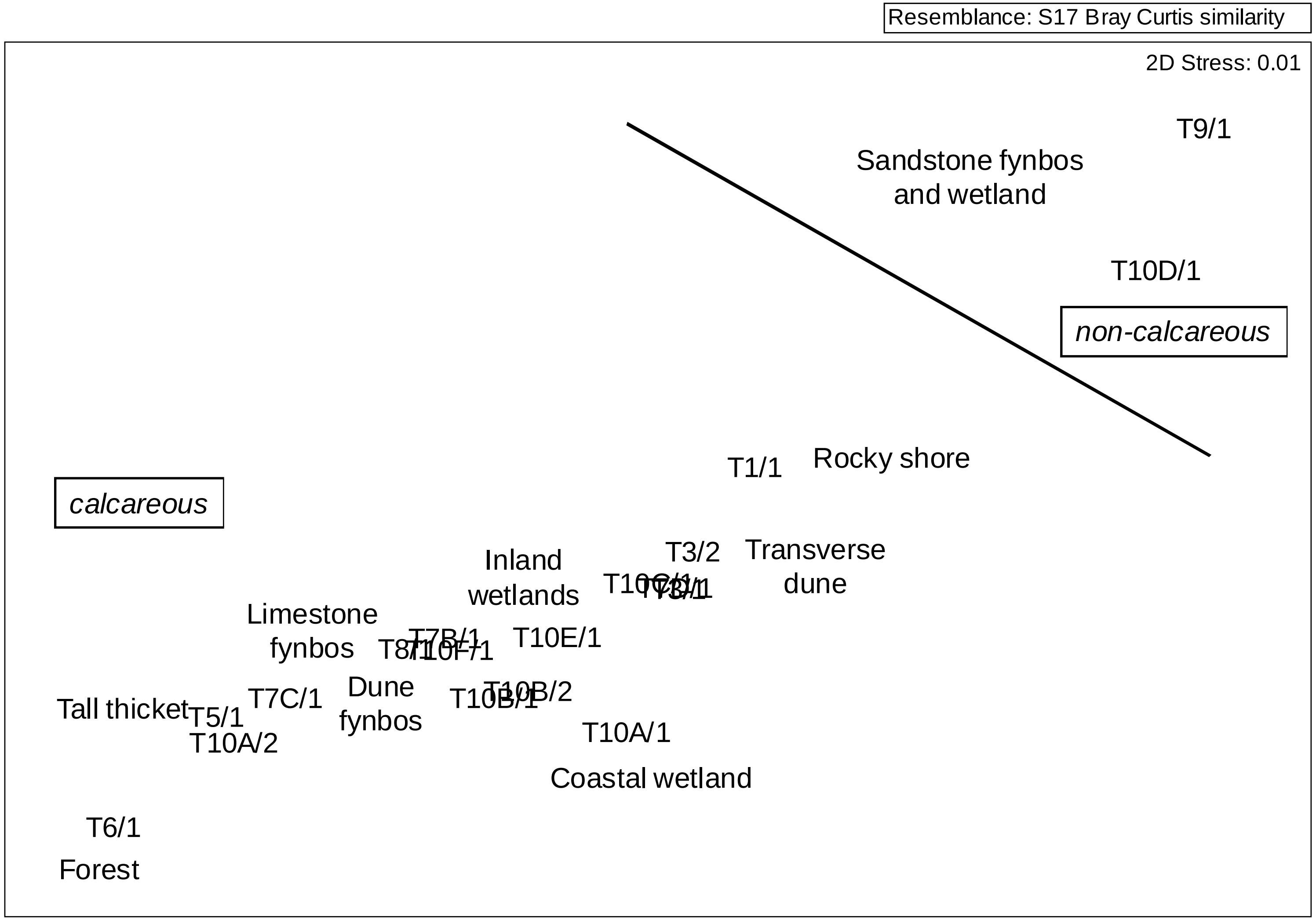


Figure 4.3.4. MDS analysis of soils from selected plant communities at Thyspunt. The difference between calcareous (left) and non-calcareous substrates (right) is clearly apparent. Description of plant communities as per Table 4.3.1.

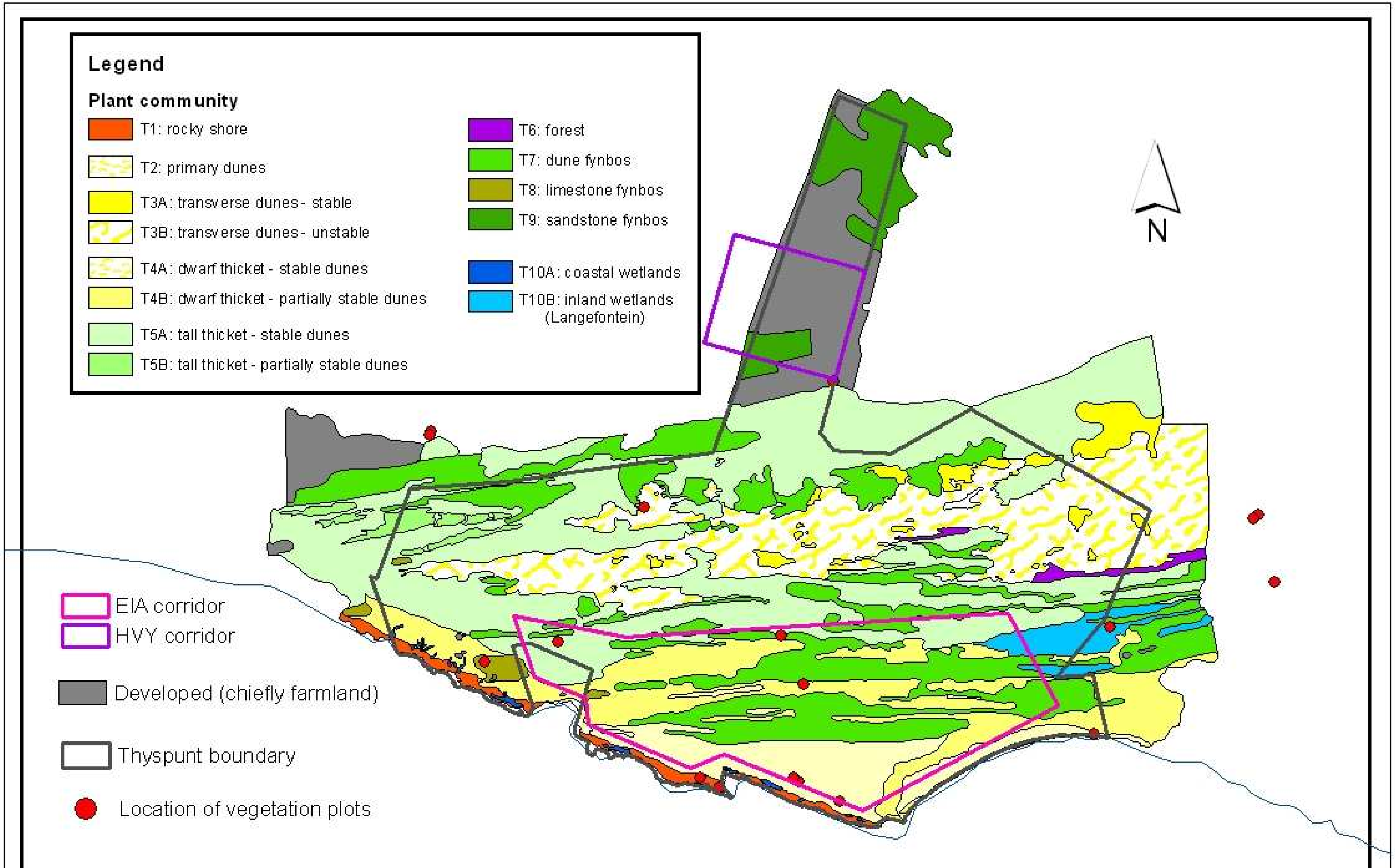


Figure 4.3.5. Plant communities occurring at Thyspunt. For community description see the text and Table 4.3.2. Note position of vegetation plots

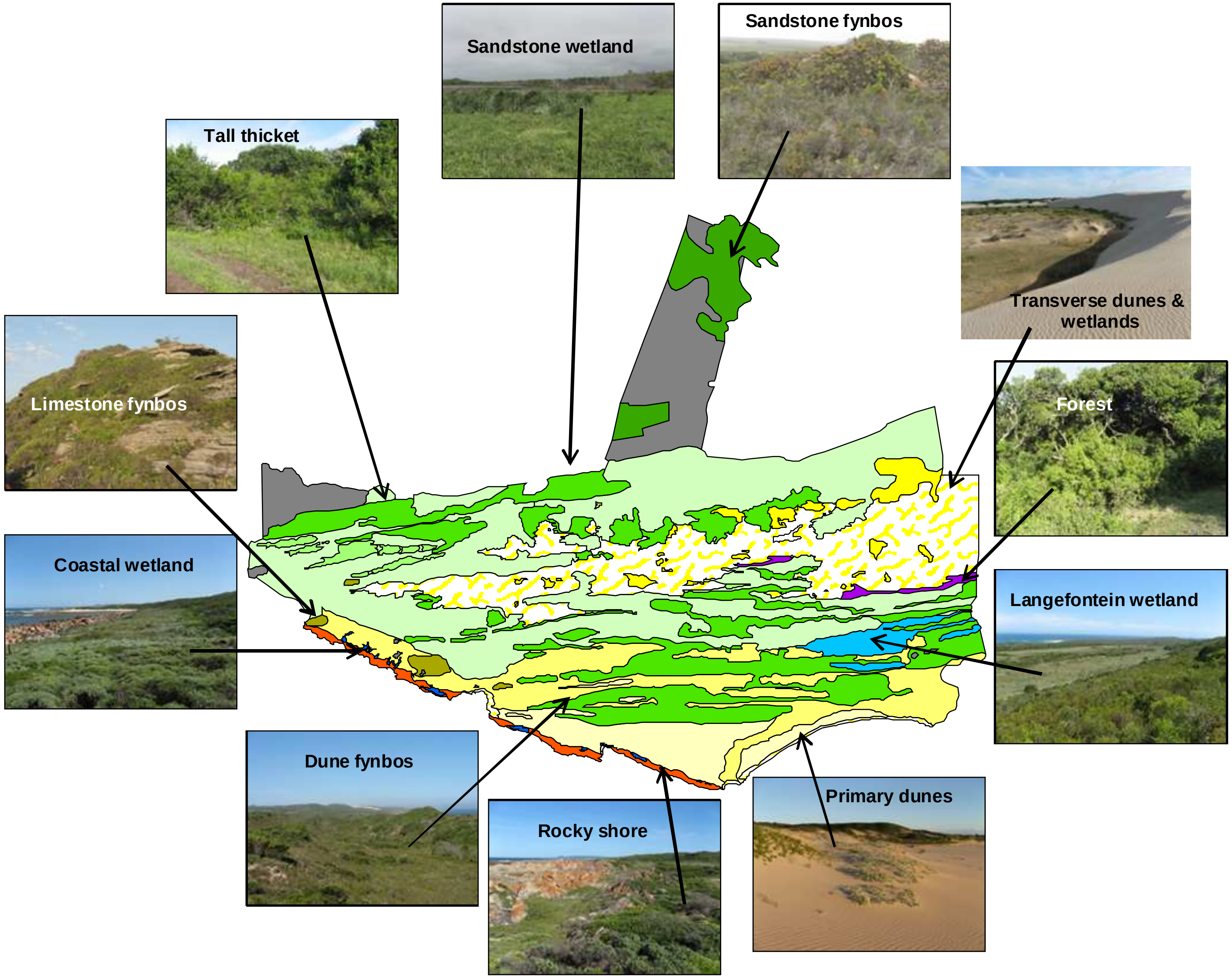


Figure 4.3.6. Thyspunt showing images of dominant plant communities. For interpretation of map, see Fig. 4.3.5

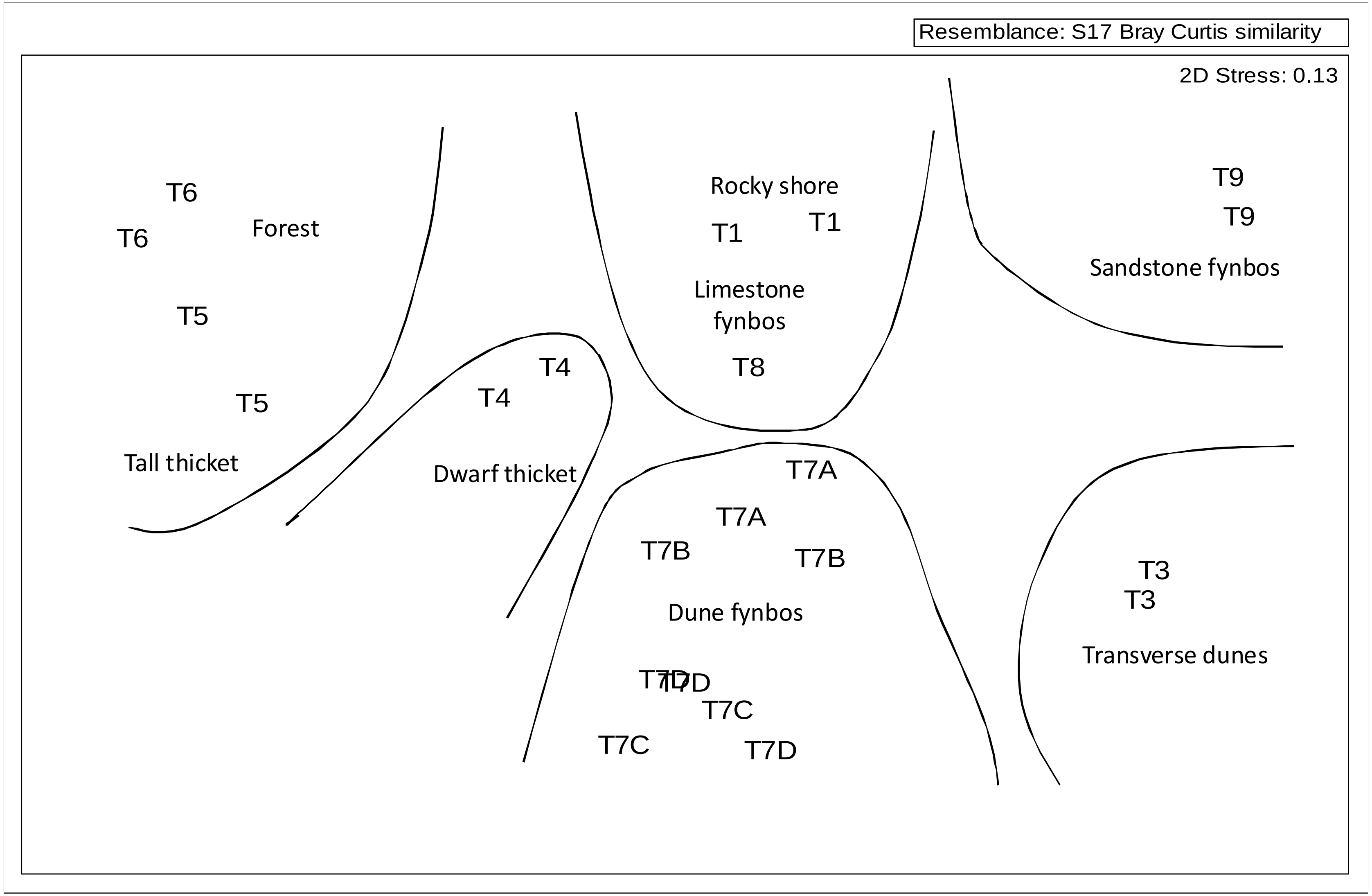


Figure 4.3.7. MDS analysis of plant communities at Thyspunt. Communities separate clearly into tall thicket and forest, dwarf thicket, dune fynbos, transverse dunes, rocky shore/limestone fynbos, and sandstone fynbos. Separation between 5% and 30% similarity

Table 4.3.2. Plant communities at Thyspunt (refer to Figure 4.3.5), together with summary of species data						
Map no	**Description**	**Flora sample**	**Vegetation (plot) sample**	**Total plant species (Red Data – see Table 4.3.6)**	**Area (ha)**	**%**
Calcareous sands and limestones						
T1	Rocky shore – shallow sand over sandstone bedrock	Yes	Yes	63 (2)	25.0	1.1
T2	Primary dunes on coast	Yes	No	30 (0)	9.9	0.2
T3	Dune fynbos on mobile to semi-mobile transverse dunes	Yes	Yes	32 (2)	399.5	18.3
T4	Dwarf dune thicket at coast	Yes	Yes	42 (0)	338.5	15.5
T5	Tall thicket on deflated parabolic dunes inland of coast (includes invasive *Acacia cyclops* rooikrans)	Yes	Yes	44 (1)	680.7	31.2
T6	Coastal forest on older dunes inland	Yes	Yes	42 (1)	10.7	0.5
T7	Dune fynbos on deflated parabolic dunes	Yes	Yes	141 (5)	403.4	18.5
T8	Fynbos on limestone, chiefly in south-west of site	Yes	Yes	74 (4)	11.1	0.5
Sandstone						
T9	Fynbos on sandstone in the northern part of the site	Yes	Yes	51 (1)	83.6	3.8
Wetlands (only coastal sites mapped – see Dr Liz day's report for detail of other wetlands)						
T10A	Coastal wetlands on calcareous sands just above the high-water mark	Yes	Yes	52 (1)	4.4	0
T10B	Inland wetland in calcareous parabolic dune slack (Langefontein)	Yes	Yes	56 (0)	38.7	1.8
T10C	Wetlands in main spine of transverse dunes	Yes	No	43 (3)	N/A	N/A
T10D	Wetland on upper Slang River	Yes	No	35 (1)	N/A	N/A
T10E	Wetlands on northern edge of transverse dunes	Yes	No	42 (3)	N/A	N/A
T10F	Middle Slang River channel	Yes	No	64 (0)	N/A	N/A
T10G	Wetland on middle Slang River	Yes	No	33 (0)	N/A	N/A
Developed	Developed areas, chiefly farmland	N/A	N/A	N/A	178.0	8.2
Total				**384 (14)**	**2 183.5**	**100.0**

Plate 4.3.1 Plant species occurring at Thyspunt: dunes

Primary dunes

Arctotheca populifolia sea pumpkin, coastal dunes endemic

Scaevola plumieri seeplakkie, coastal dunes endemic

Heliophila linearis

Dune fynbos & thicket

Erica chloroloma endemic to dune fynbos in the south-eastern Cape

Gladiolus wilsonii

Arctotis elongata in dune fynbos near the coast

Plate 4.3.1 (contd.)

Dune fynbos & thicket

Limonium sp. nov. in dune fynbos, possibly endemic

Chironia baccifera bitterbessiebos

Felicia echinata bloublommetjie, coastal fynbos and thicket endemic

Gasteria acinacifolia bontaalwyn, endemic to coastal dune thicket

Pelargonium cf. *suburbanum* subsp. *suburbanum* Eastern Cape endemic and Red Data species

Satyrium princeps rooitrewwa local endemic and Red Data species

Plate 4.3.2 Plant species occurring at Thyspunt: wetlands

Langefontein

Cyperus thunbergii common sedge in the Langefontein

Veronica anagallis-aquatica herbaceous lower vegetation stratum

Cladium mariscus subsp. *jamaicense* another sedge widespread in wetlands

Senecio halimifolius widespread in neutral to alkaline wetlands

Geranium ornithopodon scrambling herb

Kniphofia cf. *rooperi* new record for the Cape flora and found in both the coastal wetlands and the Langefontein

Plate 4.3.2 (contd.)

Transverse dunes

Merxmuellera cincta subsp. *sericea* is a habitat and regional endemic, as well as Red Data species

Satyrium hallackii subsp. *hallackii* wetland endemic

Eulophia speciosa one of three orchid species occurring in this system

Chironia peduncularis adding a touch of colour

Species numbers are surprisingly high (63) for an ostensibly pioneering community, but with only one on the Red Data list (Table 4.3.2).

This community occupies only 25 ha (1.1%) of the study area (Table 4.3.2) and is analogous with Cowling's (undated) rocky shore vegetation (Figure 4.3.3).

MDS analysis of vegetation plots (Figure 4.3.7) indicates this community to be quite distinctive, but with some relationship to the limestone vegetation found in the south-west of the site (Figures 4.3.5 & 4.3.6). This association is likely to be linked to a combination of both a thin covering of sand and a hard calcareous substrate.

Plate 4.3.3: Rocky shore (Community T1)

Primary and foredunes (Community T2 – no plots taken) (Plate 4.3.4)
Synonyms: Cowling (undated) – Sandy Shore and Pioneer Dune Communities; Mucina & Rutherford (2006) – Cape Seashore Vegetation.

Both these communities occur at the coast, on primary and foredunes immediately above the high-water mark. They are characterised by sand mobility and sparse to moderate vegetation cover, with plants generally of low height. Key species include *Arctotheca populifolia* sea pumpkin, *Dasispermum suffruticosum* duineseldery, *Felicia amoena* subsp. *latifolia, Gazania rigens* strandgousblom, *Hebenstretia cordata* kusslakblom, *Heliophila linearis, Metalasia muricata* blombos, *Morella cordifolia* dune waxberry, *Passerina rigida* duinegonnabas, *Scaevola plumieri* seeplakkie*, Seriphium plumosum* slangbos and *Tetragonia decumbens* kinkelbossie.

Species numbers for primary dunes are low (30), with none found on the Red Data list (Table 4.3.2).

This community occupies a very small area (9.9 ha (0.2%) – Table 4.3.2) and falls within Cowling's (undated) pioneer dune community (Figure 4.3.3).

Plate 4.3.4: Primary dunes (Community T2)

Transverse dunes (Community T3) (Plate 4.3.5)

Synonyms: Cowling (undated) – Drift Sands and Sand River Primary Dune Community; Mucina & Rutherford (2006) – Algoa Dune Strandveld.

Vegetation of this mobile system tends towards fynbos, although localised patches of dune thicket may be encountered. As such both pioneer and climax fynbos elements are found. Vegetation cover is understandably lowest or even absent where dune mobility is greatest. Both vegetated and unvegetated transverse dunes have been mapped separately (Figures 4.3.5 & 4.3.6). Key species include *Chironia baccifera* bitterbessiebos, *Ehrharta villosa* var. *maxima* pypgras, *Felicia amoena* subsp. *latifolia, Ficinia nodosa* steekbiesie, *Helichrysum cymosum* yellow-tipped straw flower, *Ficinia lateralis* dune sedge, *Metalasia muricata* blombos, *Morella cordifolia* dune waxberry, *Passerina rigida* duinegonnabas, *Psoralea repens* duine-ertjie and *Seriphium plumosum* slangbos.

Species numbers are low (32) as might be expected for a community on unstable sands. Two are on the Red Data list (Table 4.3.2).

This is one of the more extensive communities at Thyspunt (399.5 ha (18.3%) – Table 4.3.2), located chiefly in two broad cordons, the bigger of the two being initiated at Oyster Bay, and a smaller system at the eastern end of Thysbaai. The community is a combination of Cowling's (undated) Driftsand and Sand River Primary Dune Community (Figure 4.3.3).

Plate 4.3.5: Transverse dunes (Community T3)

Dwarf coastal thicket (Community T4) (Plate 4.3.6)

Synonyms: Cowling (undated) – Subtropical Thicket; Mucina & Rutherford (2006) – Algoa Dune Strandveld.

This is a wind- and salt spray-pruned thicket, rarely more than 1 m in height. As its name suggests, it is found close to the coast, invariably above the rocky shore and primary/foredune communities, but also mosaics with dune fynbos (see below (T7) and Cowling, 1984). The majority of species are broad-leaved and there are affinities with Cowling's (1984) subtropical thicket concept. In his classification of Kaffrarian Thicket in the area, two types are found on dunes: the *Cassine-Cussonia* and *Cassine-Schotia* communities. Dwarf thicket has the greatest affinity with the former. Key species including *Carissa bispinosa* noem-noem, *Olea capensis* subsp. *capensis* ysterhout, *Olea exasperata* slanghout, *Psydrax obovata* subsp. *obovata* kwar, *Pterocelastrus tricuspidatus* kershout, *Rhus crenata* duinekraaibessie and *Rhynchosia caribaea*. Several species occur as far as the West Coast (*sensu* Boucher, 1987) where they may be prominent in his Strandveld (= dune thicket; see also Cowling, 1984).

Fire is a key factor which maintains the Dune Fynbos-Dune Thicket mosaic (*sensu* Vlok & Euston-Brown, 2002) and is thought to limit the distribution of thicket in the Eastern Cape (Trollope, 1974).

The community supports 42 species, none of these on the Red Data species list (Table 4.3.2).

Dwarf coastal thicket is prominent at Thyspunt, occupying 338.5 (15.5%) of the area (Table 4.3.2).

Plate 4.3.6: Dwarf coastal thicket (Community T4)

Tall dune thicket (Community T5) (Plate 4.3.7)

Synonyms: Cowling (undated) – Subtropical Thicket; Mucina & Rutherford (2006) – Algoa Dune Strandveld.

This is in essence a taller form of the previous community, but occurs further inland where coastal conditions are less harsh and where parallel dune ridges offer some protection from the wind. This is a true succession to coastal forest, with the MDS analysis indicating a close relationship between the two (Figure 4.3.7). It reaches some 5 m and higher and has a closed canopy cover. Broad leaved species again dominate the community, which has affinities with Cowling's (1984) Kaffrarian Dune Thicket, as well as forest (see below). Key species include *Canthium spinosum* coastal canthium, *Cynanchum obtusifolium* bobbejaantou, *Diospyros simii* ranktolbos, *Dovyalis rhamnoides* common dovyalis and *Sideroxylon inerme* milkwood.

According to Cowling (1983a), Kaffrarian Thicket on dunes includes the following: *Cynanchum obtusifolium* bobbejaantou, *Clausena anisata* perdepis, *Dovyalis rotundifolia* duinesuurbessie, *Euclea racemosa* subsp. *racemosa* seeghwarrie, *Zanthoxylum capense* kleinperdepram, *Chionanthus foveolatus* fine-leaved ironwood, *Panicum deustum* rietbuffelsgras, *Scolopia zeyheri* doringpeer, *Euphorbia triangularis* riviernaboom, *Cassine peragua* bastersaffraan and *Pterocelastrus tricuspidatus* kershout, and tends to lack species endemism.

Tall thicket has a moderate species number (44) with only one Red Data species (Table 4.3.2)

Part of the mapped community has been invaded by *Acacia cyclops* rooikrans. It covers the largest proportion of the site (680.7 ha or 31.2 %) (Table 4.3.2).

Plate 4.3.7: Tall thicket (Community T5)

Coastal forest (Community T6) (Plate 4.3.8)

Synonyms: Cowling (undated) – Dune Forestry; Mucina & Rutherford (2006) – not mapped in area, but probably affiliated to Southern Coastal Forest.

This is the climax of the dune thicket to dune/coastal forest succession, with this community generally attaining a height in excess of 7 to 8 m, and even reaching 10 m. It appears to occupy stable sands of the deflated parabolic dune cordon, usually quite some distance from the coast. Cowling's (1984) forest classification deals only with afromontane forest of sandstone slopes of the inland mountains. However, Cowling (undated) later did map this unit (Figure 4.3.3). Then again, it is recognised as Southern Coastal Forest in Mucina & Rutherford (2006), although it is not mapped in the general study area, presumably due to the small size of the forest patches. Key species in this multi-layered community include *Allophylus decipiens* bastertaaibos, *Canthium spinosum* coastal canthium, *Cassine peragua* bastersaffraan, *Dovyalis rhamnoides* common dovyalis and *Sideroxylon inerme* milkwood. Various climbers also make up the community and these include *Asparagus africanus* bush asparagus, *Rhoicissus digitata* wild grape and *Secamone alpini* melktou. Herbaceous species in the understory include *Oxalis incarnata, Leidesia procumbens* and the grass *Ehrharta erecta*.

Forest has about the same-sized flora (42) as that of tall thicket, with one Red Data species (Table 4.3.2).

Forest occupies one of the smallest extents at Thyspunt with only 10.7 ha (0.5%) (Table 4.3.2).

Analysis of the plot data (Figure 4.3.7) indicates a close relationship between this community and that of tall thicket.

Plate 4.3.8: Coastal forest (Community T6)

Dune fynbos (Community T7) (Plate 4.3.9)

Synonyms: Cowling (undated) – South Coast Dune Fynbos/ Grassy Dune; Mucina & Rutherford (2006) – Southern Cape Dune Fynbos.

This community is found predominantly on older deflated parabolics, but a less dense and floristically different form does occur on the transverse dunes of the area (see above). Although mapped separately, much of the site supports a rich mosaic of thicket and fynbos. The balance between the two depends on at least two factors: fire and soils (Trollope, 1974; Heydorn & Tinley, 1980; Cowling, 1984). Soils probably play a minor role, as differences amongst calcareous soils at the site seem to show too little variation to influence vegetation. Suffice to say, the older, deflated parabolic dunes are probably much more leached than their younger, reworked counterparts, the transverse dunes, and are likely to have a lower base saturation. The plausible relationship between dune fynbos and coastal thicket (Cowling, 1984) is partially supported by the MDS analysis (Figure 4.3.7), where dune fynbos and dwarf thicket have an approximately 15% similarity. The analysis in fact separates dune fynbos from the other communities (Figure 4.3.7), the closest association being with rocky shore and limestone vegetation, as well as dwarf thicket. The main reason for this are the co-occurrence in these two communities of species including *Carissa bispinosa* noem-noem, *Euclea racemosa* seeghwarrie, *Metalasia muricata* blombos, *Olea capensis* subsp. *capensis* ysterhout, *Olea exasperata* slanghout, *Psydrax obovata* subsp. *obovata* kwar, four *Rhus* spp. taaibos and *Sideroxylon inerme* milkwood. This aspect is dealt with in the flora section below.

Key species in dune fynbos include *Agathosma apiculata* knoffelboegoe, *A.stenopetala, Erica chloroloma, Erica* cf. *glumiflora, Helichrysum teretifolium, Ischyrolepis eleocharis* katstertriet*, I.leptoclados* besemriet, *Metalasia muricata* blombos, *Muraltia squarrosa, Olea exasperata* slanghout and the sedge *Tetraria* cf. *cuspidata*.

For dune fynbos, Cowling (1984) records (endemics in bold) Stenotaphrum secundatum, ***Agathosma stenopetala*****,** *Limonium scabrum,* ***Erica chloroloma,*** *Morella cordifolia, Stipagrostis zeyheri* subsp. *zeyheri*, *Elegia microcarpa*, *Tribolium obtusifolium,* ***Satyrium princeps, Polygala ericaefolia,*** *Maytenus procumbens, Olea exasperata, Lauridia tetragona, Rhoicissus tridentata, Agathosma apiculata, Salvia africana-lutea, Ischyrolepis leptoclados, Jamesbrittenia microphylla, Morella quercifolia, Rhus crenata, Ficinia aphylla, Ischyrolepis eleocharis, Euclea racemosa* subsp. *racemosa, Rhus glauca,* ***Felicia echinata,*** *Rhus laevigata, Imperata cylindrica,* ***Rapanea gilliana, Phylica litoralis*** and ***Pentaschistis heptamera***.

Dune fynbos is a dominant plant community at Thyspunt, occupying 403.4 ha (18.5%) (Table 4.3.2).

This community has the highest total (141) as well as Red Rata (5) species numbers for Thyspunt (Table 4.3.2).

Although a successional relationship between Dune Fynbos and Thicket is supported by Taylor (1978), Boucher & Moll (1981) and Low & Rebelo (1998), Cowling (1983) prefers to separate the two into Fynbos and Thicket communities (Dune Fynbos here lacks proteas and has shrubs such as *Rhus*, *Olea*, *Maytenus*, and *Sideroxylon* all of which have strong subtropical affinities).

In this report the former approach is used, and, unlike Mucina & Rutherford (2006), who surprisingly assign a Fynbos Biome classification to Strandveld (Thicket) vegetation, both Dune Fynbos and Thicket are placed within the Thicket Biome defined by Low & Rebelo (1998). The thicket on the study site is described by Cowling (1983, 1984) as Kaffrarian Thicket, with a range extending from Algoa Bay to the Cape Peninsula, but with similar, albeit shorter, coastal vegetation continuing northwards as far as Lambert's Bay.


Plate 4.3.9: Dune fynbos (Community T7)

Fynbos on limestone (Community T8) (Plate 4.3.10)

Synonyms: Cowling (1984) – South Coast Dune Fynbos form on calcretes. However, this community is not recognised in both Cowling (undated) and Mucina & Rutherford (2006), possibly due to the patchy nature of its distribution.

Limestone fynbos is poorly represented at Thyspunt, occupying only 11.1 ha (0.5%) of the site. Limestones (aeolianite – Nanaga Formation – see above) clearly form the backbone of many of the dune ridges at Thyspunt and are exposed when sand is removed by wind. This results in an abrupt change in species composition due to shallower depths and sometimes different soil chemistry. Cowling (1984) includes this form of fynbos as one of three dune fynbos communities. He makes the interesting observation that thicket rarely colonises calcretes and limestones due to shallow soil depths, but this does not discount thicket elements from being present under these conditions. Elsewhere, particularly on the Cape West Coast, thicket (= Saldanha Flats Strandveld – Mucina & Rutherford, 2006) is the dominant type on calcretes of the Saldanha Peninsula (pers.obs.) and here it is too dry for fynbos to develop.

Key species in this community include *Agathosma apiculata* knoffelboegoe, *Chironia baccifera* bitterbessiebos, *Helichrysum teretifolium, Maytenus procumbens* duinekokoboom and *Sideroxylon inerme* milkwood, the last two being typical thicket species.

MDS analysis (Fig. 4.3.7) indicates a relationship, at about 15%, with rocky shore vegetation, and, to a certain extent, dwarf thicket. If Cowling's (1984) concept is followed, then there would be a natural succession from limestone fynbos to dwarf thicket as soils deepen, and this is the likely case at Thyspunt.

Plate 4.3.10: Limestone fynbos (Community T8)

(ii) Sandstone

Fynbos on sandstone (Community T9) (Plate 4.3.11)

Synonyms: Cowling (1984) – Grassy Fynbos; Mucina & Rutherford (2006) – Tsitsikamma Sandstone Fynbos.

This community is restricted to the narrow south-north strip in the northern part of the site, north of the transverse dunes. Most of this community has been severely degraded through high frequency burning - presumably for grazing - as well as likely over-grazing and trampling (there are a number of cattle farms in this area). Vegetation tends to be one to five years old, with older stands occurring occasionally outside the Thyspunt boundary. Cowling (1984) confirms a burn history of 4 – 5 years in the area. Sandstone soils are notoriously low in plant important nutrients (Kruger, 1979; Low, 1980) and acidic. This is shown in the MDS analysis of soils (Figure 4.3.4) where sandstone and calcareous soils plot out at opposite ends of the figure, indicating a predictably low similarity between the two groups.

The sandstone and acidic sand fynbos vegetation of the montane and coastal plain in this region has been described by Cowling (1983, 1984) as Grassy Fynbos. In this vegetation type (Tsitsikamma Sandstone Fynbos in Mucina & Rutherford, 2006), the restios in Mountain Fynbos (*sensu* Taylor, 1978; Kruger, 1979), are replaced by grasses (Cowling, 1984).

Cowling (1984) described five Grassy Fynbos communities in the area: the *Erica-Trachypogon* community is found on sandstone and best describes the sandstone vegetation of the Thyspunt site. Diagnostic species in Grassy Fynbos (endemics in bold) (Cowling, 1983) include: ***Passerina pendula,*** *Erica decipiens,* ***Phylica abietina,*** *Chaetacanthus setiger, Clutia affinis, Brachiaria serrata, Indigofera denudata, Aspalathus chortophila* subsp. *chortophila, Hermannia flammea, Clutia polifolia, Satyrium membranaceum, Gerbera piloselloides,* ***Erica demissa, Otholobium polyphyllum,*** *Sporobolus centrifugus,* ***Senecio crenatum, Podalyria burchellii,*** *Helichrysum nudifolium,* ***Euryops munitus,*** *Ficinia tristachya, Trachypogon spicatus, Bobartia orientalis, Rhus rosmarinifolia, Pentaschistis pallida,* ***Protea tenax,*** *Helichrysum appendiculatum, Arctopus echinatus, Diheteropogon filifolius, Elionurus muticus, Tribolium hispidum, Ehrharta calycina, Tristachya leucothrix, Helichrysum anomalum, Cliffortia linearifolia, Erica pectinifolia* and *Ficinia gracilis.*

Key species in the present study include *Erica* cf. *sparmannii*, *Helichrysum teretifolium, Leucadendron salignum* sunshine bush, *Protea neriifolia* blousuikerbos, *Tetraria bromoides* bergpalmiet and *Thamnochortus fruticosus* besemriet. The vegetation rarely attains more than 2 m in height, with cover to about 90%.

Sandstone fynbos occupies 83.6 ha (3.8%) of the area at Thyspunt (Table 4.3.2).

MDS analysis (Figure 4.3.4) shows this community to be quite different from those occurring on calcareous substrates.

Plate 4.3.11: Sandstone fynbos (Community T9)

(iii) Wetlands

Wetlands (Communities T10A to T10G – T10F is a sample on the Slang River) – plots only in T10A & T10B

Synonyms: not mapped by Cowling (1984 or undated); Mucina & Rutherford (2006) – not mapped as probably at too small a scale, but probably most closely associated with Cape Lowland Freshwater Wetlands.

Apart from not being mapped by Cowling (undated) as a general wetlands category, it appears these communities are not described further.

Although six wetland suites were identified on the site, based on their botanical composition, the wetland specialist report by the Fresh Water Consulting Group should be consulted for more detail. Wetlands ranged from seeps at the coast, through the Langefontein system, where water gathers in parabolic dune slacks – presumably over a calcrete hard pan (*sensu* Cowing, 1984), to vleis on the transverse dunes. Further inland, on the northern margin of the transverse dunes, a further suite is found, with the last two being located along drainage lines serving the Slang River. MDS analysis of the wetland vegetation sampled in the study (Figure 4.3.8) indicates tight clustering into four assemblages: coastal, Langefontein, transverse dunes and Slang River. Details of wetland drivers can be found in the wetland specialist study by the Fresh Water Consulting Group.

The coastal wetlands (T10A) (Plate 4.3.12) are small seeps which daylight just above the high-water mark, and as such lie in the same coastal zone as the rocky shore community described above (T1). They are characterised by surprisingly high species numbers for a wetland (52), but with only one on the Red Data list (Table 4.3.2).

Key species include *Cyperus thunbergii, Helichrysum gymnoconum*, *Hypoestes aristata* seeroogblommetjie, *Phragmites australis* fluitjiesriet and *Senecio halimifolius* tabakbos. Plant cover is 100%, with heights to 1.5 m.

These wetlands occupy a very small proportion (4.4. ha, <0.1%) of the site (Table 4.3.2).

The Langefontein inland wetland (T10B – Plate 4.3.13) on the other hand, is a much larger, consolidated system, being bounded on either side by old parabolic dune ridges. Total area is 38.7 ha (1.8%). Two sub-communities were recognised. In the first, key species include the tall cosmopolitan sedge *Cladium mariscus* subsp. *jamaicense*, *Helichrysum cymosum* yellow-tipped straw flower, *Nidorella auriculata*, *Senecio halimifolius* tabakbos, *Solanum africanum* melkellie and *Thelypteris confluens* bog fern In the second these were *Chironia peduncularis*, *Helichrysum cymosum*, *Mentha aquatica* wild mint, *Neesenbeckia punctoria*, *Senecio halimifolius* and *Thelypteris confluens*.

Species number is 56 with none on the Red Data list (Table 4.3.2).

The transverse dune wetlands in the south (not mapped, but see specialist report by the Freshwater Consulting Group) (Community T10C – Plate 4.3.14) are part of a mobile system, and as such “move” with the dunes! This imparts a certain temporary nature to each wetland, but nevertheless supports a modest number of species (43), of which three are Red Data (Table 4.3.2). Key species include

Centella asiatica waternael, *Elegia microcarpa*, *Juncus kraussii* biesie, *Merxmuellera cincta* subsp*. sericea* and *Plecostachys serpyllifolia* vaaltee.

On the northern edge of the transverse dunes are found the T10D wetlands (Plate 4.3.15), essentially part of the upper Slang River system (outside the Thyspunt boundary, but included for comparison), and located on sandstone alluvium. These wetlands are severely perturbated by cattle grazing and the resultant eutrophication. Key species include *Berula erecta* subsp. *thunbergii* tandpynwortel, the sedges *Carex* cf. *aethiopica* and *Cyperus thunbergii*, *Hydrocotyle verticillata* pennywort and *Pennisetum clandestinum* kikuyu (introduced). Total species number is a moderate (35), with one on the Red Data list (Table 4.3.2).

On the northern margin of the transverse dunes, the T10E wetland complex (Plate 4.3.16) is found, and, as with the T10C suite, is located on calcareous sands. Key species include *Juncus capensis* rush and *Merxmuellera cincta* subsp. *sericea* olifantsgras. Species number is similar to the T10C transverse dune wetlands (see above), with a total of 42 and three on the Red Data list (Table 4.3.2).

Plate 4.3.12: Coastal wetland (Community T10A)

Plate 4.3.13: Langefontein wetland (Community T10B)

Plate 4.3.14: Transverse dune wetlands in south (Community T10C)

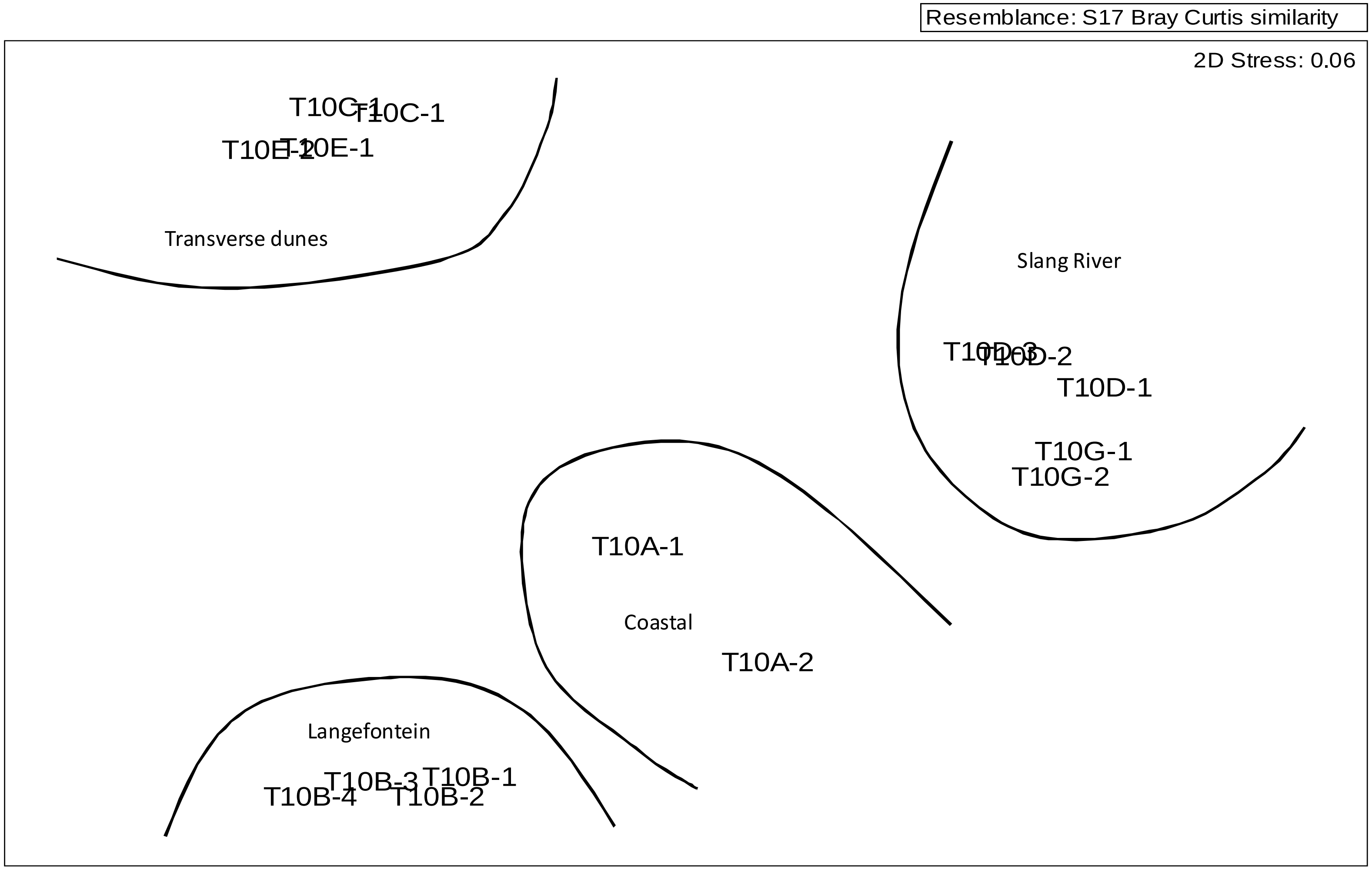


Figure 4.3.8. MDS analysis of wetland plot data at Thyspunt. Four broad suites are apparent: coastal, Langefontein, transverse dunes (alkaline, calcareous), and those on the Slang River (non-calcareous, neutral to acidic). Separation of communities at about 15 to 30% similarity

Plate 4.3.15: Sandstone wetlands (Community T10D)

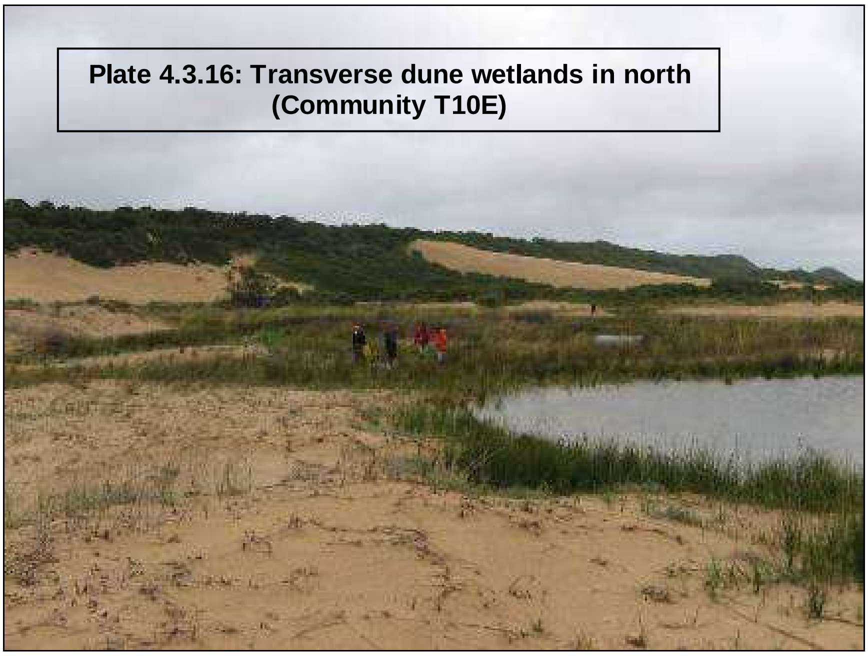


Plate 4.3.16: Transverse dune wetlands in north (Community T10E)

The final two sites are on the middle Slang River (T10F & T10G) (Plates 4.3.17 & 4.3.18), where soils are alluvial and calcareous, and the wetlands are probably fed by drainage from the transverse dunes. Key species on the Slang River (no plots) are *Cliffortia odorata* wildewingerd, *Cineraria erodioides, Fuirena hirsuta, Halleria lucida* tree fuchsia, *Hibiscus diversifolius, Juncus lomatophyllus, Psoralea affinis* fonteinbos*, Senecio lanceus* vleibos*, Rapanea melanophloeos* boekenhout and *Phragmites australis* fluitjiesriet, and with a total of 62 species, but none on the Red Data list (Table 4.3.2).

Plate 4.3.17: Slangrivier (river) (Community T10F)

The last wetland, T10G (Plate 4.3.18), is located on the upper banks of the Slang and as such represents a longitudinal wetland. Key species include: the sedge *Cyperus thunbergii*, *Hydrocotyle verticillata* pennywort and the aquatic herb *Persicaria attenuata*. Species number for this wetland is 33 and none occur on the Red Data list.

Plate 4.3.18: Slangrivier (wetlands) (Community T10G)

c Floristic analysis

(i) Local analysis

MDS analysis of local terrestrial floras is shown in Figure 4.3.9. The close association of dune fynbos, limestone fynbos and dwarf thicket is clearly apparent, as is a slightly lesser link with the rocky shore flora. However the expected succession to tall thicket and forest, the latter closely aligned at 45% similarity, is not present and this is echoed in the vegetation analysis above. Primary and transverse dunes display good similarity. Sandstone fynbos is the most dissimilar site (95%), reinforcing the strong dichotomy between calcareous and non-calcareous habitats.

For the wetlands, MDS analysis (Figure 4.3.10) also offers interesting patterns. The primary and transverse dune systems show very little similarity with the other wetland habitats. The latter all display a similarity of 30 to 50%, but could be viewed as their own floras.

(ii) Subregional analysis

Two analyses were run to determine site distinctiveness for Thyspunt. The first was for sandstone fynbos. Unfortunately the sandstone fynbos sample for the area is too small to undertake a reasonable comparison. However, Cowling's (1983) Grassy Fynbos list was used as a surrogate. A selection of predominantly sandstone floras was used and these were taken from the SaSFlora database (SaSFlora, 1998 – 2011). A site and species matrix was created from which similarity values were obtained using Bray Curtis similarity tests in the PRIMER package (Clarke & Warwick, 1884) and then compared with distance from Thyspunt (Table 4.3.4). The same was undertaken for calcareous substrates (Table 4.3.4). In both situations there is an inverse linear correlation between distance and similarity: i.e. the further away a locality is from a particular site, the less similar are the two floras, as might be expected. The linear correlation for sandstone is highly significant (regression: $y = -111x + 26.65$ ($R^2 = 0.937$)). For predominantly calcareous substrates it is also highly significant: $y = 0.142x + 56.96$ ($R^2 = 0.991$). That the flora of Thyspunt is distinctive is borne out by the moderate similarity with Cape St. Francis (56%), only 10 km to the east. A possible explanation for this is that high species turnovers are the rule rather than the exception in Cape fynbos, with figures as great as 60% over 25 km for the south-western Cape mountains (Kruger & Taylor, 1979). Much of this could be attributed to steep ecological gradients associated with mountainous terrain (Cowling *et al.*, 1992), whilst it is suspected that variation in soils and moisture status drive similar turnovers along this coastline.

d Endemism

A summary of endemism at Thyspunt, based upon the species distribution data in Appendix 4.3.3, is shown in Table 4.3.3. Endemism is extremely low for the site, with only one local endemic (*Delosperma patersoniae*) and three regional and habitat endemics (*Alepidea delicatula, Senecio oederiifolius* kouterbossie and *Agathosma stenopetala*).

Images of several key species encountered in the study are shown in the text.

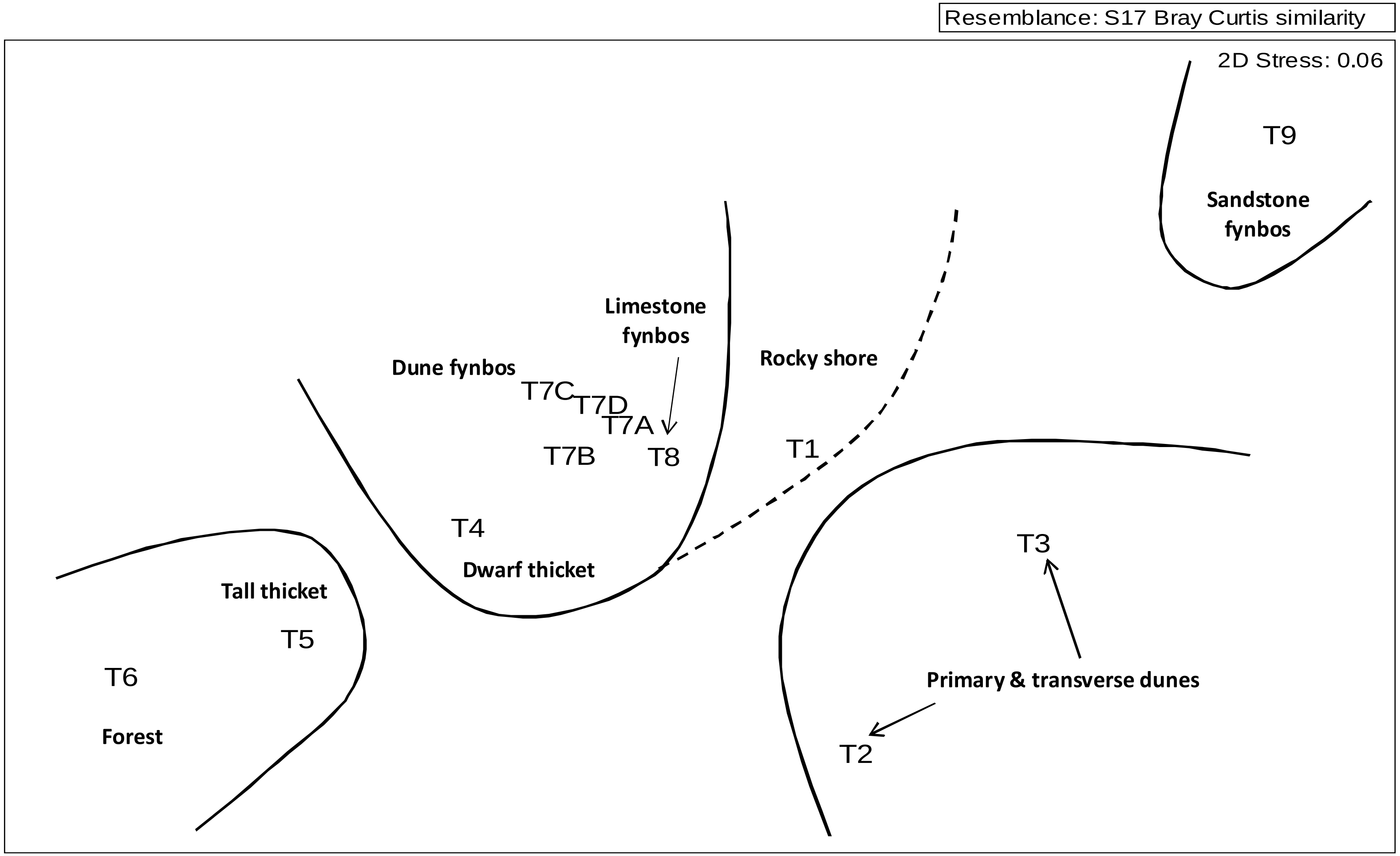


Figure 4.3.9. MDS analysis of local floras occurring at Thyspunt. There is a clear separation into calcareous (left) and non-calcareous floras (sandstone fynbos) (extreme right of plot). Note the close association (45%) amongst dune & limestone fynbos and dwarf thicket, and lower similarity with the rocky shore flora (35%). Tall thicket and forest are closely aligned, but the expected succession between dwarf and tall thicket appears to be lacking

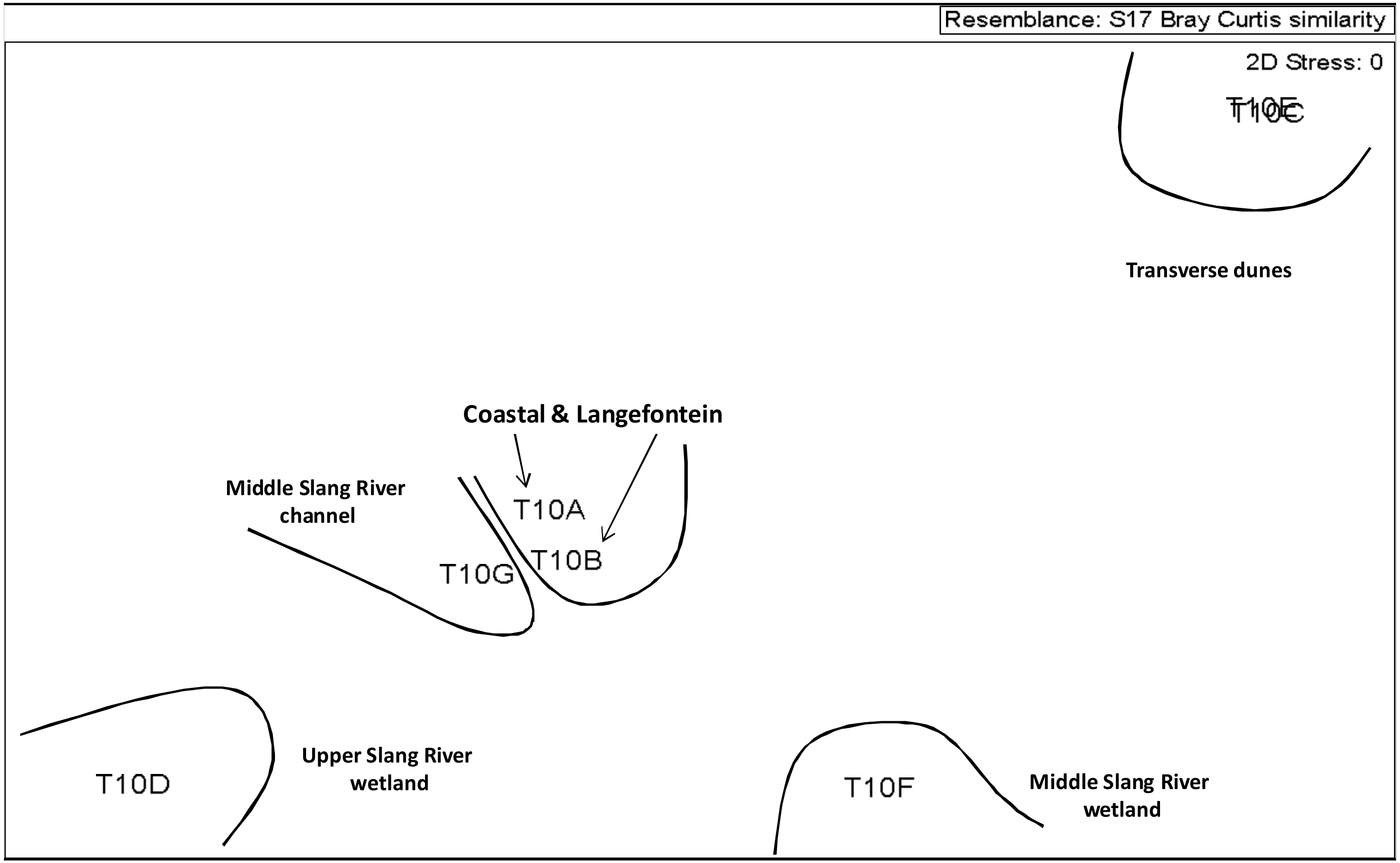


Figure 4.3.10. MDS analysis of wetland floras at Thyspunt. The transverse dune wetlands are the least similar (15%), with fairly close association amongst the coastal, Langefontein and Slang River sites (25 to 50% similarity). Effectively, each of the latter are different floras, underlining the unique characteristics of these systems in the area. Note the major difference between the two middle Slang River sites.

Table 4.3.3. Summary of endemic status of plant species occurring at Thyspunt

Community	Community description	Species number				
		Local and habitat endemics	Local endemics	Regional and habitat endemics	Regional endemics	**Total endemics**
Dunes						
T1	Rocky shore	1	0	0	0	1
T2	Primary dunes	0	0	0	0	0
T3	Transverse dunes	0	0	0	0	0
T4	Coastal dwarf thicket	0	0	0	0	0
T5	Tall thicket	0	0	0	0	0
T6	Forest	0	0	0	0	0
T7	Dune fynbos - general	1	0	1	0	2
T7A	Dune fynbos	0	0	0	0	0
T7B	Dune fynbos	0	0	0	0	0
T7C	Dune fynbos	0	0	0	0	0
T7D	Dune fynbos	0	0	0	0	0
Limestone						
T8	Coastal limestone	1	0	0	0	1
Sandstone						
T9	Sandstone	0	0	2	0	2
Wetlands and river						
T10A	Coastal wetland	0	0	0	0	0
T10B	Langefontein wetland	0	0	0	0	0
T10C	Transverse dune wetland	0	0	0	0	0
T10D	Sandstone wetland	0	0	1	0	1
T10E	Dune wetland	0	0	1	0	1
T10F	Slangrivier streamline	0	0	1	0	1
T10G	Slangrivier wetland	0	0	0	0	0
Total		**1**	**3**	**0**	**0**	**4**

Table 4.3.4. Flora similarity percentages and distance from Thyspunt		
Locality	**Distance (km)**	**Similarity (%)**
Sandstone fynbos		
Formosa Nature Reserve	100	16.3
Keurbooms Nature Reserve	120	13.6
Millwood Nature Reserve	170	5.2
Outeniqua Nature Reserve	230	2.2
Fynbos and thicket on calcareous sands and limestone		
Cape Receife	80	33.5
Cape St. Francis	10	56.1
Goukamma Nature Reserve	165	34.6
Woody Cape Nature Reserve	160	33.5

e Dune systems

Mapped dunes of the Thyspunt site, and approximately 90 km of coastline are shown in Figure 4.3.11. Dune types and systems are adapted from Tinley (1985), Low & Pond (2004) and Low & Pond (2006a & 2006b). Because of the small area they occupy, barchanoids, in effect transverse dune precursors, were included under transverse dunes. Four major dune types are recognised: embryo or primary dunes at the coast, parabolic dunes which display two broad ages – those which retain their high parallel ridges and those which have been deflated with time. The final type is the transverse dune which largely represent reworked parabolics (Tinley, 1985) and which are the major mobile systems along the coastline. Parabolics comprise the highest proportion of dunes in the subregion (12 849 ha or 85.7%) (Table 4.3.5), with transverse 11.3 and embryo 3.0%. The proportion occurring in Thyspunt is 77.7, 16.1, 18.5 and 0.3 % respectively.

Of major significance is the presence in the Oyster Bay-Cape St. Francis area of the largest headland bypass dune system on the South African coastline (Tinley, 1985; La Cock & Burkinshaw, 1996), and see the aerial photographs in Figure 4.3.12. Much of this system is located within Thyspunt, where two transverse dune cordons are found. These have been discussed under Community T3 – transverse dune vegetation – above. Although Thyspunt possesses only 9.4% of the dune systems along some 90 km of mapped coastline (Figure 4.3.11; Table 4.3.3), the headland bypass system is endemic to the Oyster Bay-Cape St. Francis area in terms of its composition and extent. It is also relatively intact, although severely perturbated at its western (Oyster Bay) and eastern (Cape St. Francis) ends.

Table 4.3.5. Dune type and extent along the Thyspunt & environs coastline. Area determined from GIS coverage in Figure 4.3.11

Dune type	Area (subregion) (ha)	% of total	Area (Thyspunt) (ha)	% of Thyspunt	% Thyspunt of total
Embryo	450.4	3.0	1.5	0.1	0.3
Parabolic	5 835.5	38.9	183.4	13.0	3.1
Parabolic – deflated	7 013.3	46.8	913.2	64.7	13.0
Transverse	1 690.7	11.3	312.6	22.2	18.5
Total	**14 990.1**	**100.0**	**1 410.7**	**100.0**	**9.4**

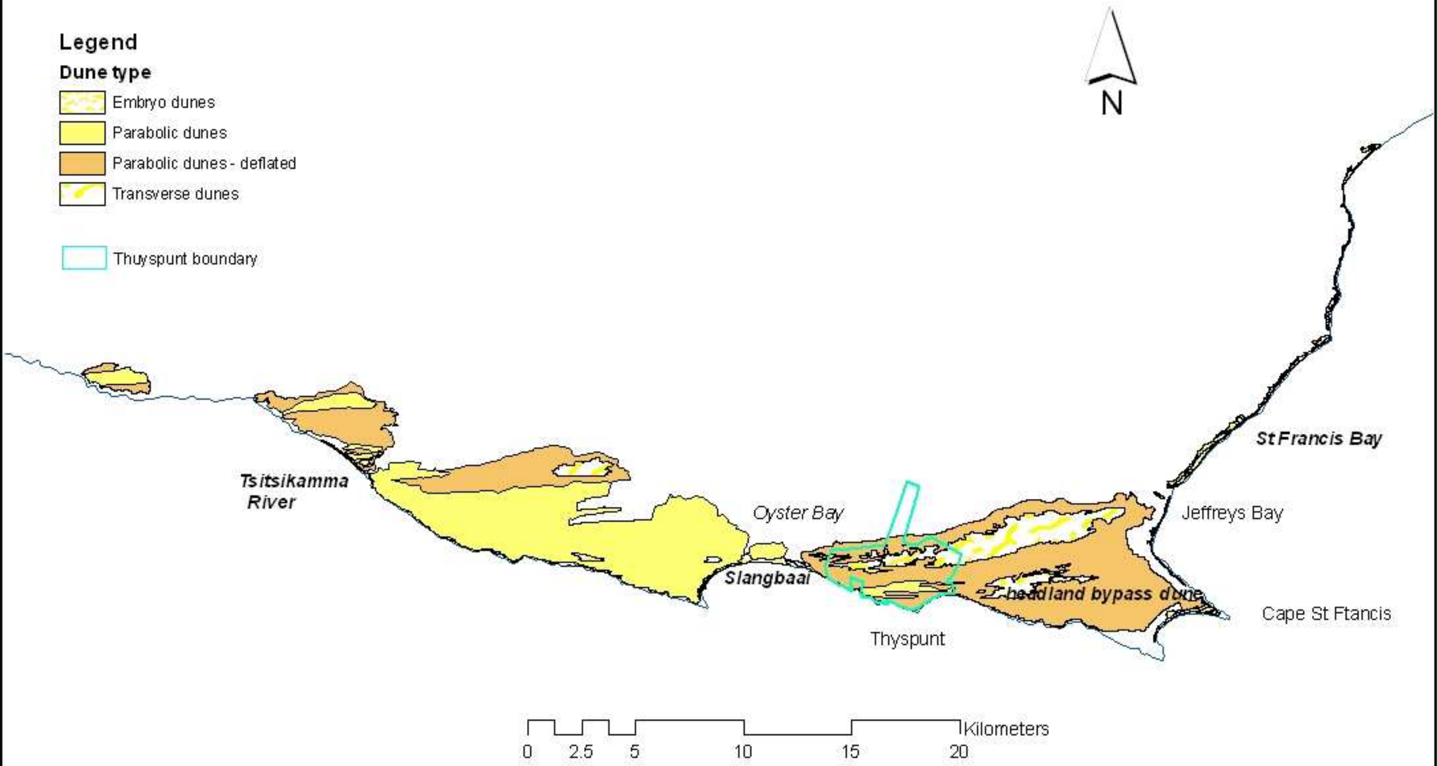


Figure 4.3.11. Dune systems of the Thyspunt & environs coastline. Note the major headland bypass dune situated between Oyster Bay and St Francis Bay, and the extent of the transverse dunes

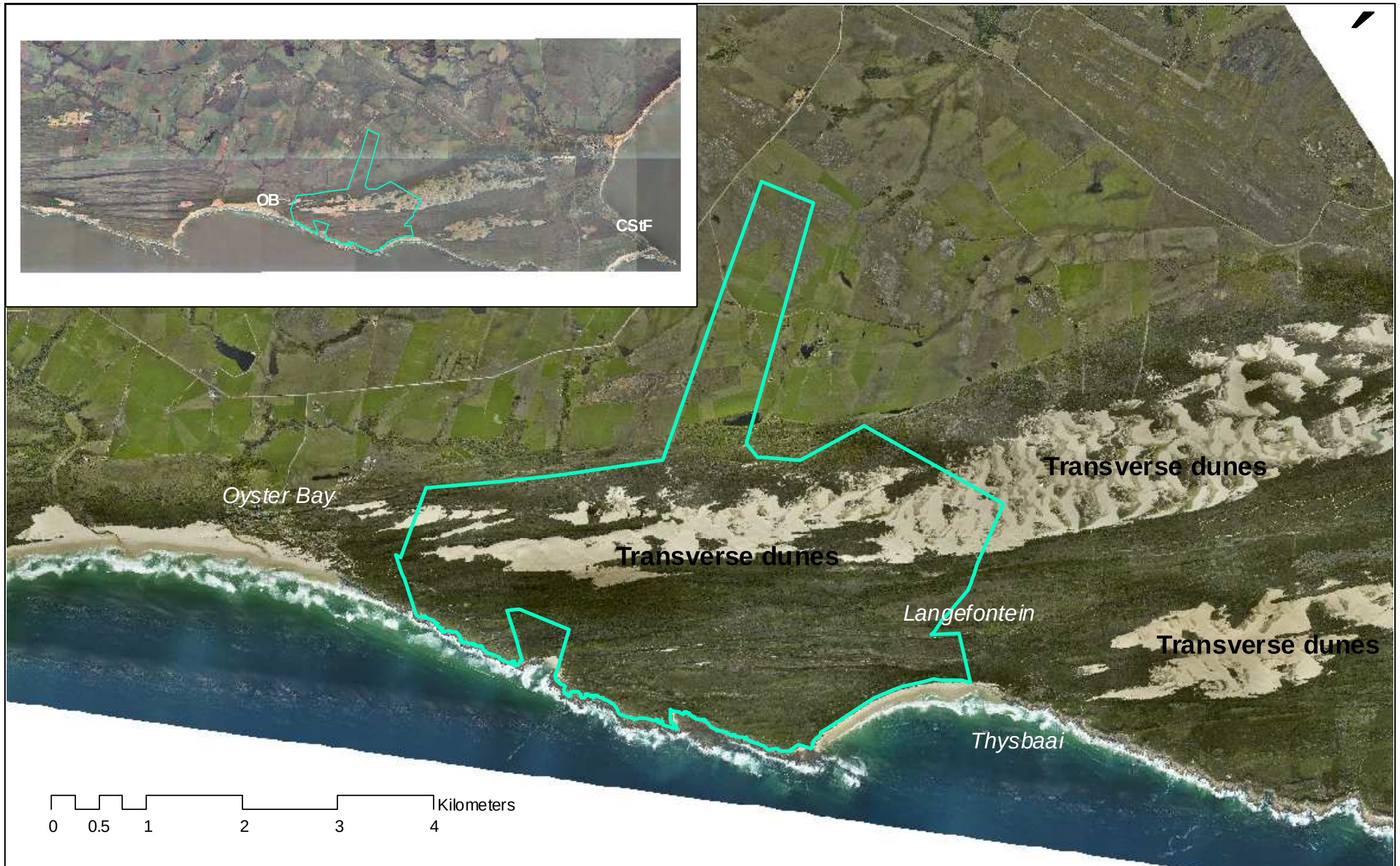


Figure 4.3.12. Position of the northern mobile transverse dune complex at Thyspunt, initiating at Oyster Bay, clearly evident. The southern complex initiates at the the eastern reaches of Thysbaai. Inset: headland bypass system between Oyster Bay and Cape St Francis

4.3.3 Rarity and sensitivity analysis

a Rarity

Rarity for the site is shown in Figure 4.3.13, where vegetation type, habitat, and Red Data species (unweighted and weighted) are assessed, based upon the data appearing in Appendix 4.3.4. Vegetation type rarity is low, with either Least Threatened (largely dune fynbos and thicket) or Vulnerable (coastal wetlands) present (*sensu* Rouget *et al*., 2004). Whilst vegetation type rarity is on the whole at too broad a scale (*sensu* Rouget *et al*., 2004) to be meaningful to point scale planning, habitat rarity – although also low at the site - provides a means to address this issue and enables decisions to be made at plant community level. Species rarity is extremely low compared to many other coastal sites (Low, unpub.; Cowling *et al*., 1988b), with only 14 (3.6%) on the Red Data list (Table 4.3.6). Highest numbers are found in dune fynbos and the transverse dunes (Figure 4.3.13). Overall rarity (Figure 4.3.14), which presents a total, weighted value, for rarity across the site (see Appendix 4.3.4), indicates highest rarity for the transverse dunes, rocky shore, coastal wetlands and the Langefontein, as well as for sandstone fynbos (Figure 4.3.14).

b Sensitivity

Four criteria were selected for sensitivity: erosion potential, susceptibility to drought, proneness to fire and resilience, the measure of a community to recover from disturbance. These are shown in Figure 4.3.15 and combined in Figure 4.3.16 (calculated from Appendix 4.3.4). These criteria, whilst perhaps not as significant as rarity for guiding location of development nodes at Thyspunt, nevertheless are important informants for management and conservation on the site, particularly with a view to regulation and management during construction. Fire is also a critical consideration given that the fire proneness of most of the site is very high; if development is allowed to proceed, then fire management will be a crucial aspect of the EMP.

4.3.4 Conservation

A number of conservation assessments has been conducted for the Cape flora. Conservation importance of the coastal area, including all of Thyspunt is high (Figure 4.3.17), with Cowling *et al*. (1999) in their assessment of irreplaceability within the Cape Floristic Region, giving a 100% irreplaceability rating. Low (2003), in his assessment of the ecological importance of the areas covered by the Table Mountain (geological) Group, rates the site lower (40 - 60%) but with the area to the east stretching to Cape St. Francis as 60 - 80%. However, in a later study for the Subtropical Thicket Ecosystem Planning (STEP) project, Cowling *et al*. (2002) also provide a lower ranking (40 – 60%) for coastal thicket and fynbos in the Thyspunt region.

Conservation status for the area is extremely low - there is a small provincial nature reserve at Cape St. Francis itself and the Rebelrus Private Nature Reserve, just to the east of the study site. Thyspunt is a proclaimed national heritage site, but neither this nor a private nature reserve guarantees any long-term conservation status for the land. Nevertheless a conservancy has been proposed (Gert Greeff, pers.comm.) to cover some 25 km of coastline, including Thyspunt.

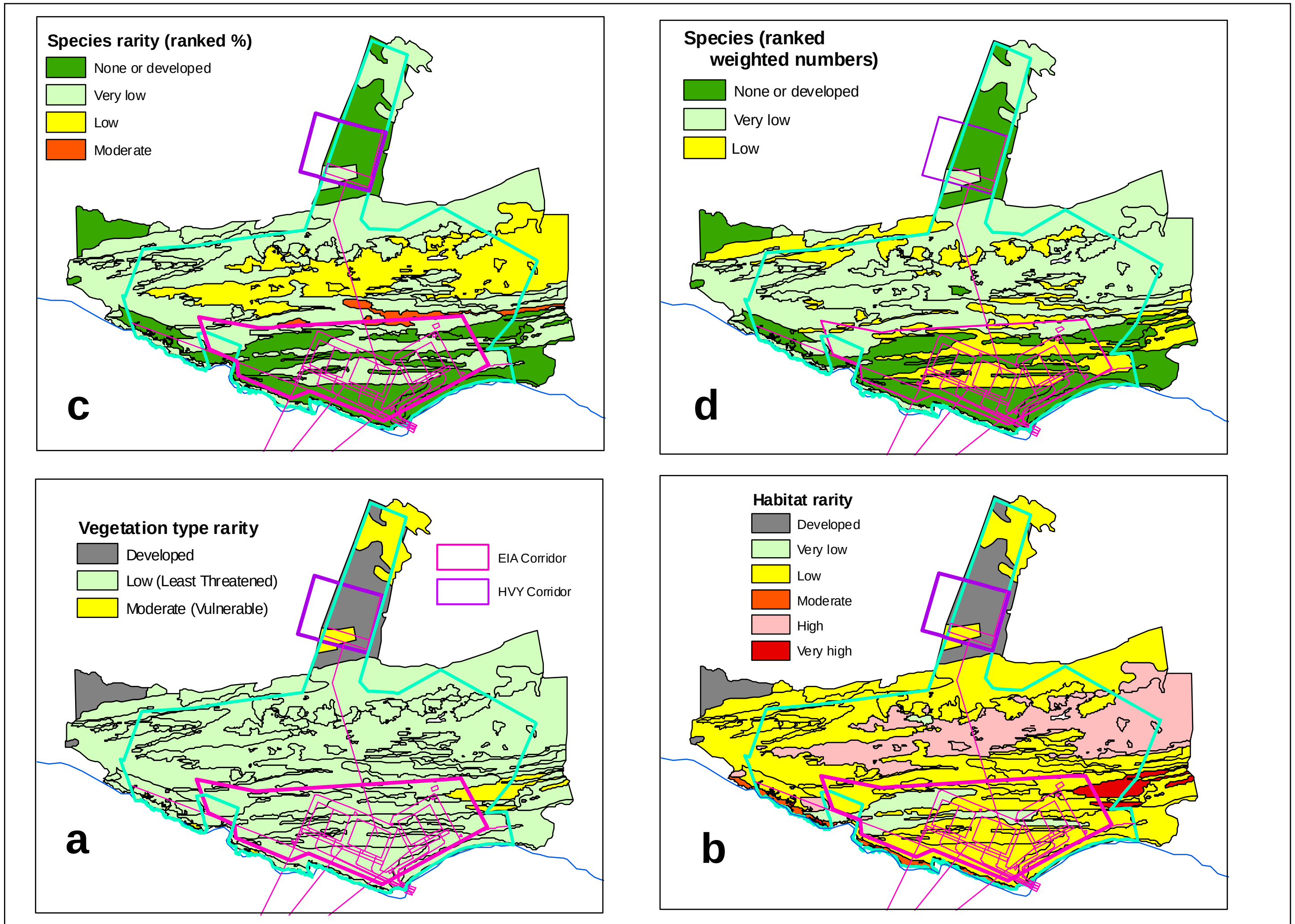


Figure 4.3.13. Rarity at Thyspunt, showing position of nuclear power station footprints. a: vegetation type; b: habitat; c: species (%); d: species (weighted numbers). Rarity calculated from values in Appendix 4.3.4.

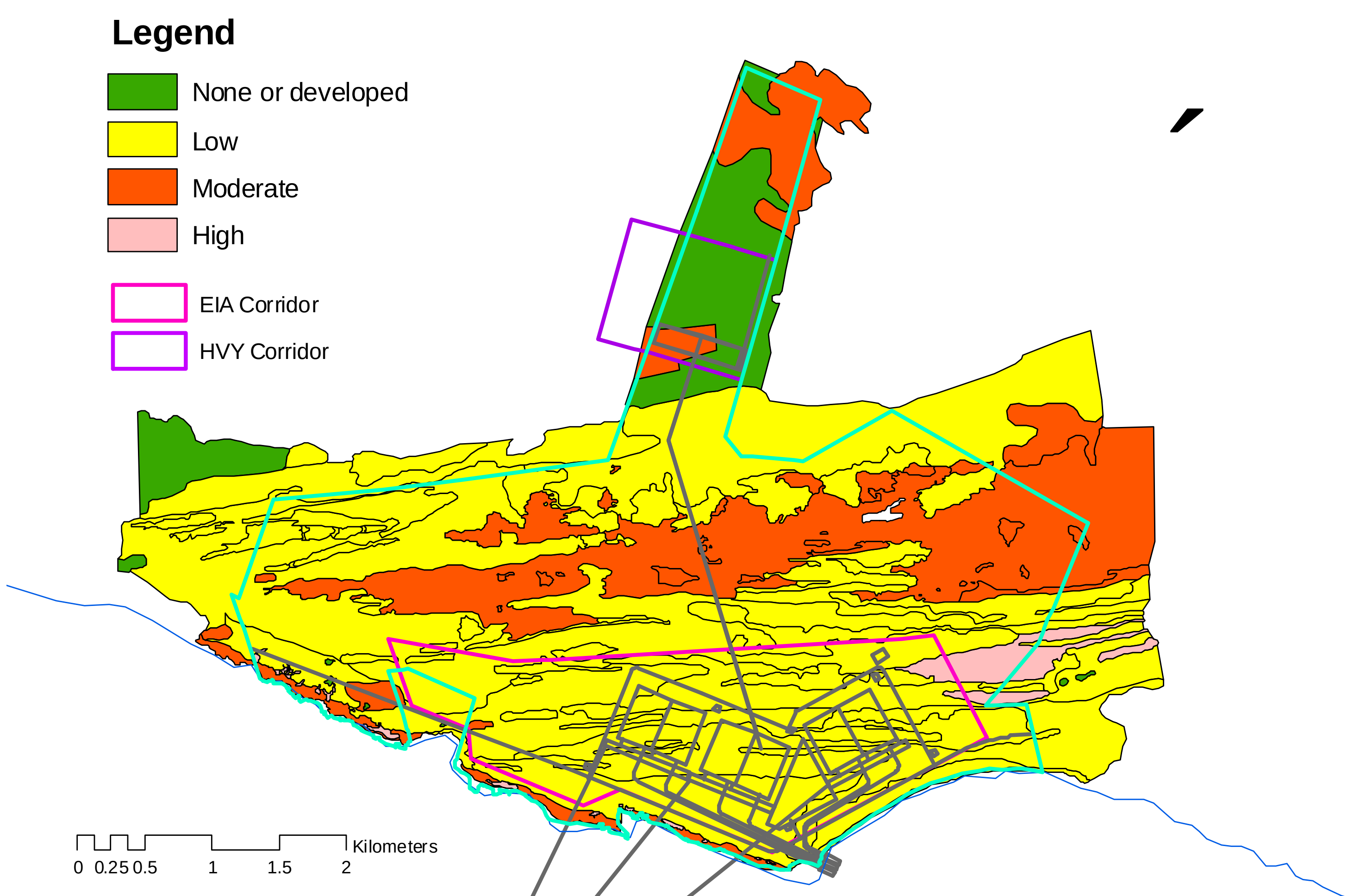


Figure 4.3.14. Overall rarity at Thyspunt, showing position of proposed nuclear power station footprints. Rarity calculated from values in Appendix 4.3.4

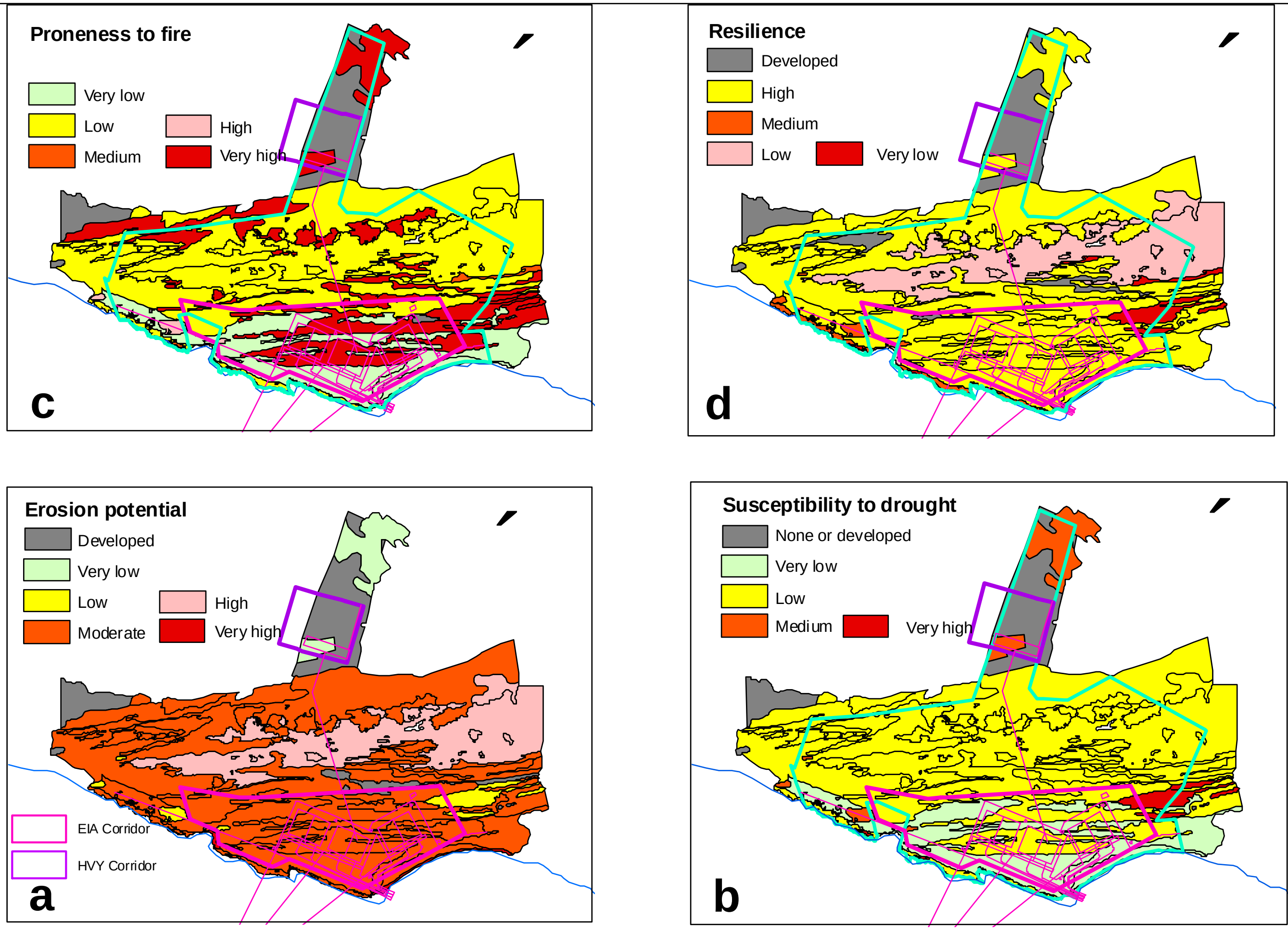


Figure 4.3.15. Ecological sensitivity at Thyspunt, showing proposed nuclear power station footprints. a: erosion potential; b: susceptibility to droughting; c: proneness to fire; d: plant community resilience. Sensitivity calculated from values in Appendix 4.3.4

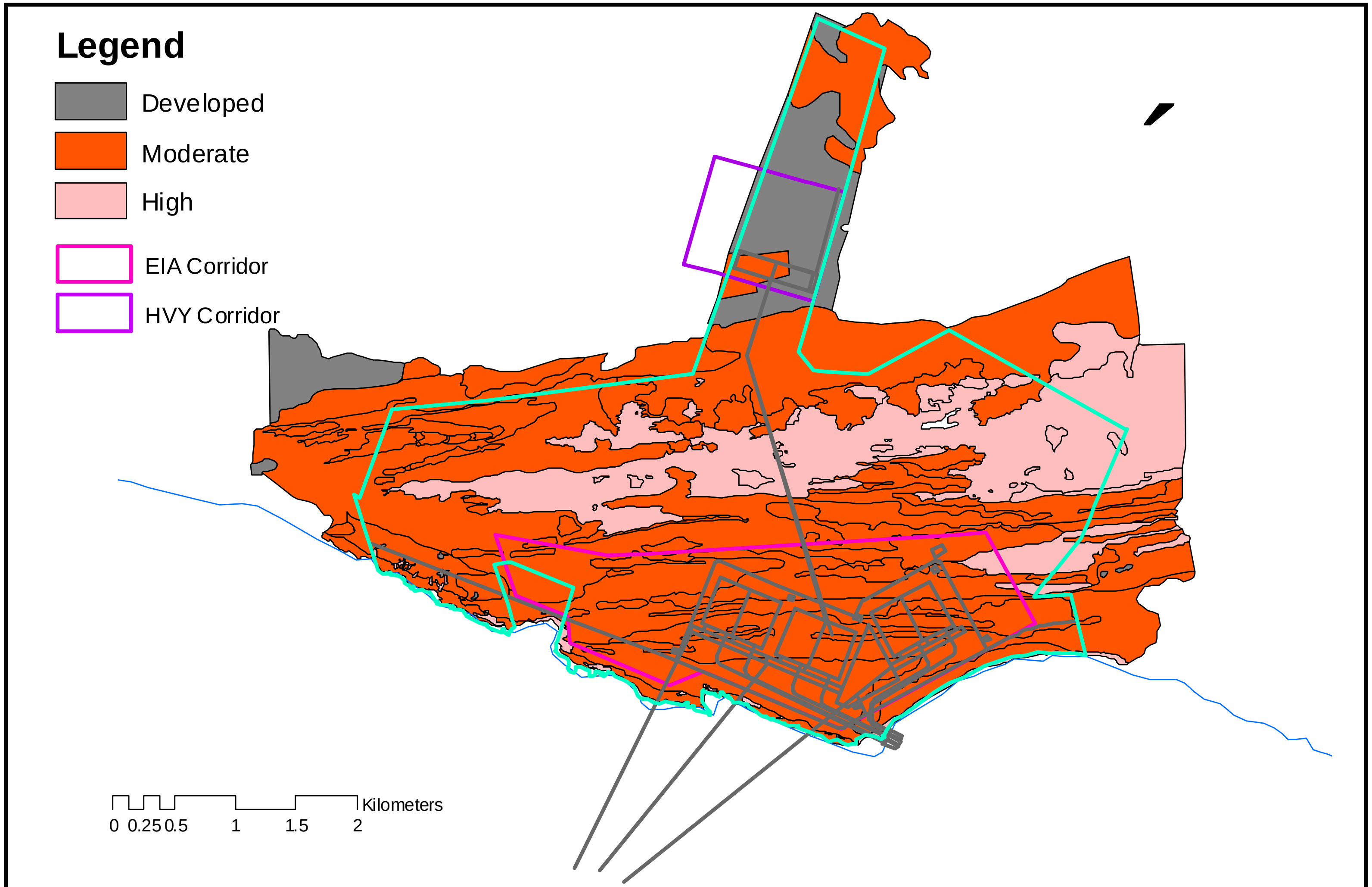


Figure 4.3.16. Overall sensitivity at Thyspunt, showing proposed nuclear power station footprints. Sensitivity calculated from values in Appendix 4.3.4

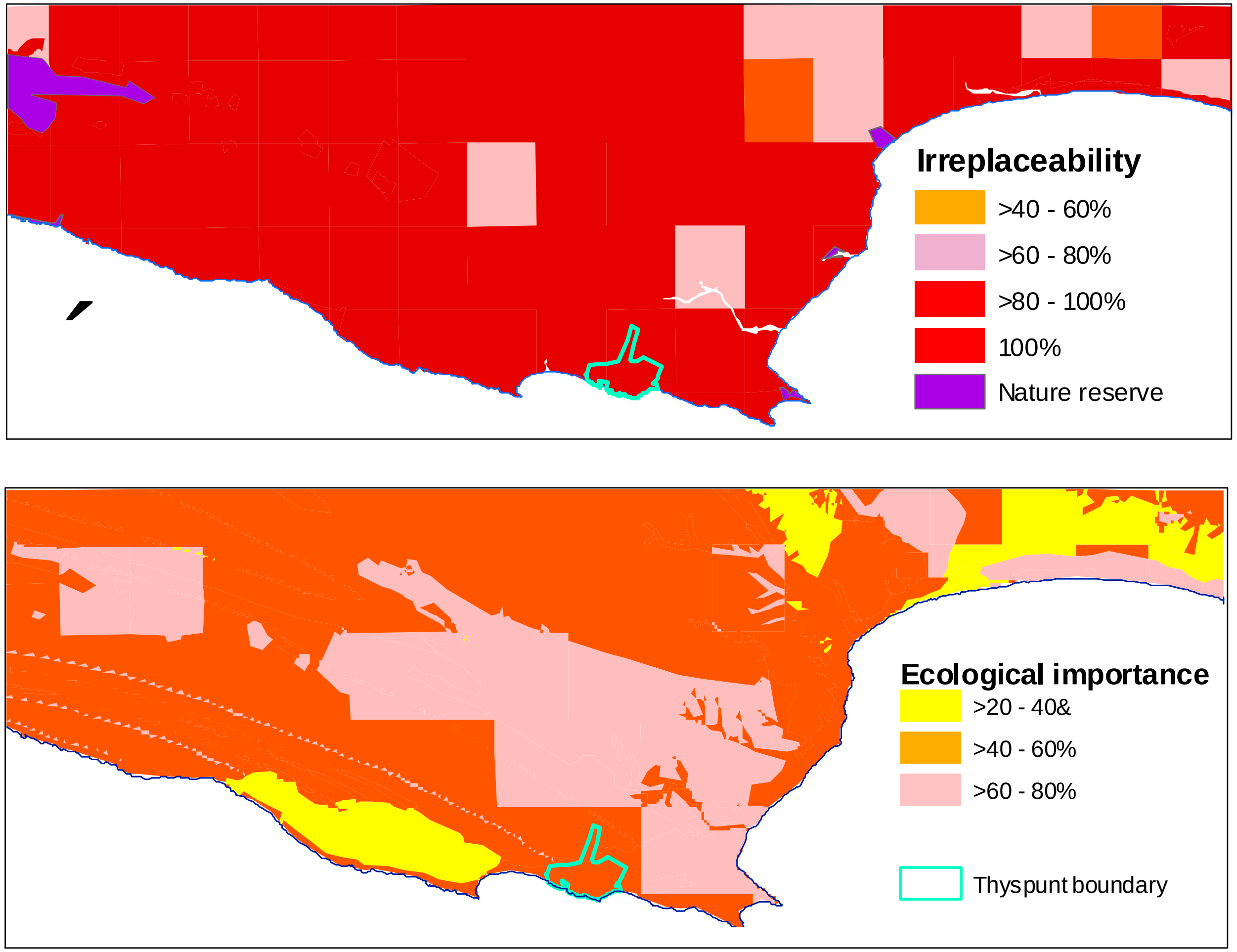


Figure 4.3.17. Irreplaceability (Cowling et al., 1999) (top) and ecological importance (Low, 2003) (bottom) for the Thyspunt & environs coastal area

The STEP project, whilst focusing on thicket vegetation in the Eastern Cape, also *de facto* identifies the southern part of Thyspunt as important, albeit as forming part of a much larger Dune Mega Conservancy Network (Cowling *et al*., 2002). Here a dune thicket mosaic (Cowling *et al*., 2002) is recognised as part of the Central Dune Thicket category. In the STEP project, the headland bypass system is termed Cape St. Francis Dune Thicket and is given a conservation status of Endangered, much higher than that of Rouget *et al*. (2004) for the SANBI vegetation type equivalent.

At present much of the Dune Thicket is highly threatened by urbanisation and ribbon development along the coast (Cowling *et al*., 2002; Vlok & Euston-Brown, 2002), not only directly in being displaced by towns and townships, but also indirectly by use of Thicket species by local inhabitants (Berry, 1993). Surprising then that the STEP project ranks the transverse dune systems between Oyster Bay/Thysbaai and Cape St. Francis Bay as being transformed (Cowling *et al*., 2002, their Figure 4.5). Certainly the southern mobile dune field is intact, and the northern counterpart, whilst being attenuated at both its ends by Oyster Bay (partially) and the golf course at Cape St. Francis (in its entirety) are nevertheless worthy of priority conservation action.

Table 4.3.6. Red Data species occurring at Thyspunt. Based upon the latest Red Data species list courtesy of SANBI

Family	Species	Present red data status	Site Description	Plant community
Dicotyledones				
APIACEAE	*Alepidea delicatula*	R	Sandstone	T9
ASTERACEAE	*Othonna rufibarbis*	Th (NT)	Dune fynbos Coastal limestone	T7 T8
ASTERACEAE	*Syncarpha sordescens*	VU	Rocky shore Coastal Wetland	T1 T10A
ERICACEAE	*Erica glumiflora*	VU	Dune fynbos Coastal limestone fynbos	T7 T8
FABACEAE	*Psoralea repens*	NT	Rocky shore Transverse dune Coastal limestone Transverse dune wetland Transverse dune wetland	T1 T3 T8 T10C T10E
GERANIACEAE	*Pelargonium suburbanum* subsp. *suburbanum*	VU	Dune fynbos Coastal limestone	T7 T8
MYRSINACEAE	*Rapanea gilliana*	EN	Tall thicket Dune fynbos	T5 T7
RUTACEAE	*Agathosma stenopetala*	VU	Dune fynbos	T7
SCROPHULARIACEAE	*Selago rotundifolia*	VU	Sandstone wetland	T10D
Monocotyledones				
CYPERACEAE	*Tetraria brachyphylla*	NT	Dune fynbos	T7
DIOSCOREACEAE	*Dioscorea sylvatica*	VU	Forest	T6
ORCHIDACEAE	*Satyrium hallackii* subsp. *hallackii*	EN	Transverse dune wetland Transverse dune wetland	T10C T10E
ORCHIDACEAE	*Satyrium princeps*	VU	Dune fynbos Coastal limestone	T7 T8
POACEAE	*Merxmuellera cincta* subsp. *sericea*	VU	Transverse dune Transverse dune wetland Transverse dune wetland	T3 T10C T10E

NT: Near Threatened; R: Rare; VU: Vulnerable; EN: Endangered
Th: likely to be threatened, but not confirmed; note this is a South African category and is not recognised internationally.

5 IMPACT ASSESSMENT AND MITIGATION

This section identifies and assesses the various possible negative and positive impacts that might arise as a result of the construction and operation of a NPS and associated activities at the three sites. Assessment is in accordance with Government Notice R.385, promulgated in terms of Section 24 of the NEMA and the criteria drawn from the IEM Guidelines Series, Guideline 5: Assessment of Alternatives and Impacts, published by the DEAT (April 1998). These criteria have been summarised and provided by Arcus Gibb.

Criteria used in the impact assessment are described in Section 1.2.3 and Appendix 5.1.1, with the rating scale used also shown in Appendix 5.1.1.

5.1 Duynefontein

5.1.1 Negative impacts

Only impacts associated with the construction of one NPS and one HV Yard are considered here, and not the whole EIA corridor. The impact assessment maps nevertheless provide a good basis from which to prioritise the least sensitive and rare areas for such construction to occur.

c Loss of habitat and species

(i) Nuclear power station and HV Yard

Extent of the proposed EIA corridor and HV Yard comprises some 455 and 257 ha respectively (calculated from shape files using ArcMap), with the NPS and associated infrastructure likely to be in the order of 230 ha (see Figure 5.1.1).

Vegetation type

Most of the proposed EIA corridor and HV Yard is located in Cape Flats Dune Strandveld (CFDS) or Community K3 (transverse dunes), which is a subtype of CFDS. This vegetation type has a rarity ranking of Endangered (Rouget *et al*., 2004) (i.e. **high** rarity), with a further subtype of CFDS - Community 7 (tall thicket on parabolic dunes – Least Threatened) - being potentially affected in the north of the site) (Figure 5.1.1a and also Figure 4.1.5 and Appendix 4.1.5). The primary dunes (Cape Seashore vegetation - Least Threatened and **low** rarity) might also be impacted, depending on what coastal setback is created. Such loss will be locally, regionally and nationally significant and permanent.

Habitat

The footprint would be located in habitat of **high** rarity (Figure 5.1.1b and also Appendix 4.1.5). Such loss would be permanent and local, regional and national.

Species rarity (unweighted)

All phases are located in areas which have **low** species rarity (Figure 5.1.1c and also Appendix 4.1.5). Red Data species losses would be localised and permanent.

Weighted species rarity

Weighted species rarity is **Very low** to **Low** (Figure 5.1.1d and also Appendix 4.1.5). Red Data species losses would not be as significant as above, but would be localised and permanent.

The following Red Data species are potentially affected (see Table 4.1.8): *Babiana tubulosa* var. *tubulosa* witbobbejaantjie (VU), *Capnophyllum africanum* (NT), *Cotula duckittiae* ganskos (VU), *Euphorbia caput-medusae* subsp. *marlothiana* vingerpol (VU), *Helichrysum cochleariforme* duineteebossie (NT), *Passerina ericoides* kusgonnabas (VU), *Psoralea repens* duine-ertjie (NT), the succulent shrub *Ruschia indecora* (EN)and *Satyrium carneum* rooitrewwa (NT).

(ii) Powerlines and access roads

Vegetation type

The powerlines and access roads from the proposed nuclear facility would cross the transitional transverse dunes/parabolic dunes (Cape Flats Dune Strandveld) as well as Atlantis Sand Fynbos. Both are Endangered (Rouget *et al*., 2004) or have **high** rarity. This would lead to possible local, regional and national losses of this system, Communities 4 and 10 (Figure 5.1.1a and see also Figure 4.1.5 and Appendix 4.1.5).

Habitat

Habitat rarity for the transitional vegetation is **medium** whilst that of the acid sandy acid flats is **Very high.** Losses at a local, regional and national level would thus be significant (Figure 5.1.1b and also Appendix 4.1.5). Losses would be compounded if a service road were to be built under the powerlines, and habitat is lost to new roads.

Species rarity (unweighted)

Species rarity in the transitional vegetation is **low**, but **Very high** on the sandy flats (Figure 5.1.1c and also Appendix 4.1.5). Potential losses of Red Data species are thus significant for the local, regional and national level.

Species rarity (weighted)

Weighted rarity is **Very low** in the transitional vegetation but **Very high** in the sand plain fynbos (Figure 5.1.1d and also Appendix 4.1.5). Losses in the latter are thus expected to be significant at a local, regional and national level. The following Red Data species are potentially affected (see Table 4.1.8): *Afrolimon purpuratum* papierblom (CR), *Aspalathus ternata* bolblomertjiebos (VU), *Babiana tubulosa* var. *tubulosa* witbobbejaantjie(VU), *Cotula duckittiae* ganskos (VU), *Diosma aspalathoides* haasboegoe (NT), *Diosma dichotoma* (VU), *Disa draconis* lilac disa (EN), *Hermannia procumbens* subsp. *procumbens* poproos (CR), *Lampranthus explanatus* geelsandvygie (EN), *Leucadendron levisanus* Cape Flats conebush CR), *Leucospermum hypophyllocarpodendron* subsp. *canaliculatum* slangbossie (VU), *Nemesia strumosa* balsamienie (NT), *Polycarena capensis* geelopslag (NT), *Ruschia indecora* (EN) and *Serruria decipiens* Weskusspinnekopbos (VU).

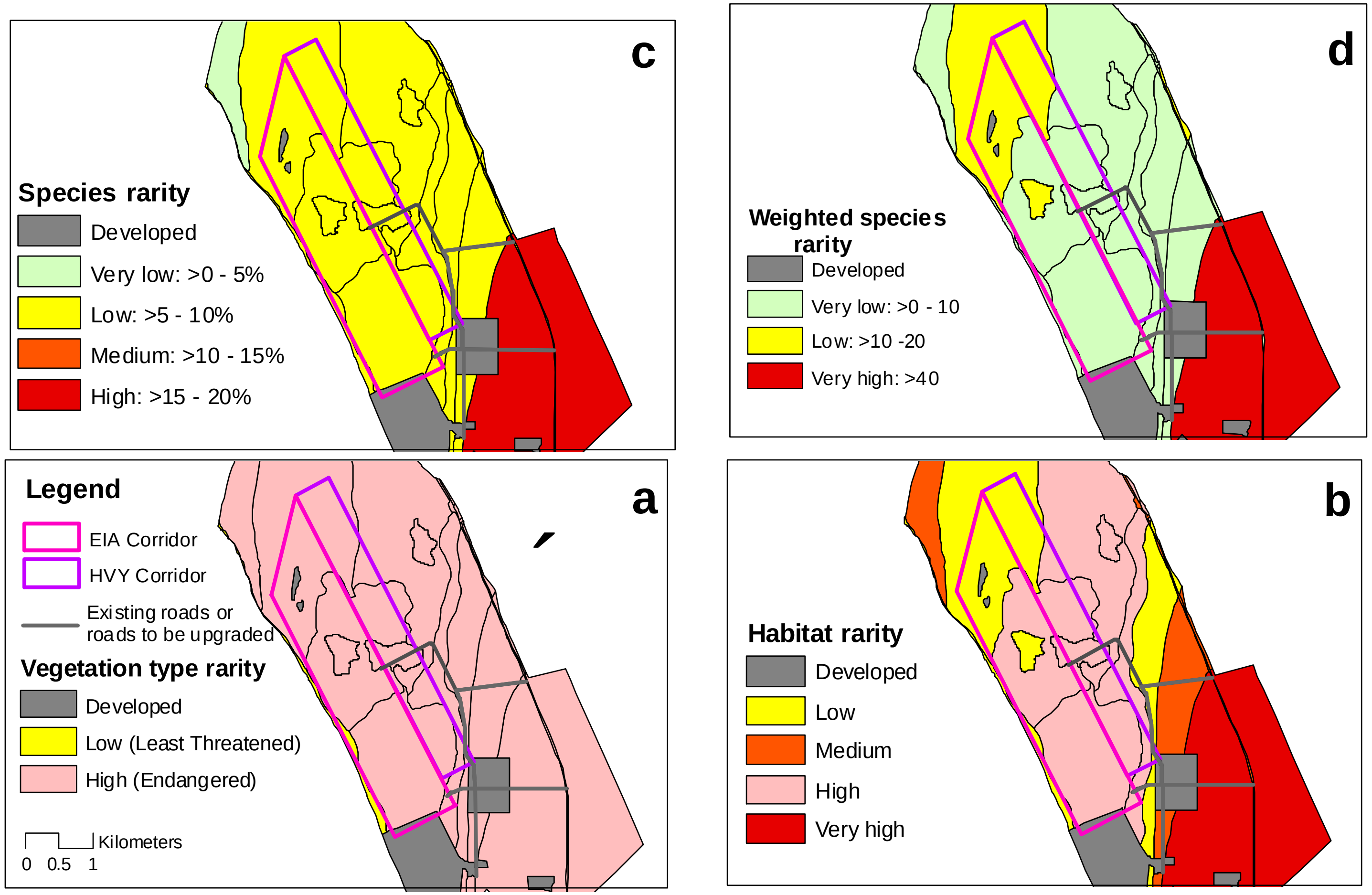


Figure 5.1.1. Impacts associated with proposed footprints (EIA & HV Yard corridors, and roads) for a nuclear power station at Duynefontein. a: vegetation type rarity; b: habitat rarity; c: % species rarity (unweighted); d: weighted species rarity

(iii) Spoil sites

It is estimated that some ***6.480.*** million m^3 of sand and a further ***1.282*** million m^3 of bedrock will need to be removed ***to spoil*** for construction of the NPS (figures supplied by Eskom). Excavation for a NPS causes a number of major impacts:

a) stockpiling of spoil elsewhere on the site or preferably off site;

b) dealing with such spoil, as only ***2.333*** million m^3 will be used as backfill and possible landscaping on site; and

c) linked with excavation activity is the operation of plant as well as transport of material away from the site.

All of the above would cause potential impacts through loss of natural vegetation and Red Data species (locally) to excavation and road construction, damage to vegetation and have major implications for rehabilitation. Indirect impacts would result from dust in both the excavation as well as transport process.

However, assuming previously disturbed sites are used, then impacts on vegetation type, habitat and Red Data species would be negligible (see under Rehabilitation, below).

d Loss of dune and dune ecosystem function

Construction of a nuclear facility would potentially lead to the loss of most of a large transverse dune system (Figure 5.1.2), **endemic** to the lower Cape West Coast. This system is poorly represented in the region, although there is a large transverse dunefield to the north-east at Witzand and a similar, but larger, more intact system north of Yzerfontein (see Figure 4.1.12). The Duynefontein system is remarkable for its size (nearly 1 000 ha) and location at the coast, just above the primary dunes (Figure 4.1.13). Despite the present position of the Koeberg Power Station to the south, and at the start of this system, thereby somewhat compromising the supply of sand to the north (the general direction of sand movement), field observations, together with those of the dune geomorphologist, confirm that there is fairly substantial inland sand movement from the south-west, suggesting there has either been somewhat of a "correction" in the system, or the south-western source has been present for some length of time.

e Loss of function in sand plain fynbos

This system would be affected by and large by the construction of powerlines to the south and east of the nuclear facility, as well as by access roads. This would lead to the partial loss of ecosystem function, particularly where the powerline bases are located and roads are constructed.

5.1.2 Climate change

A 1:100 year sea level floodline (based upon the year 2075, allowing for 60 years' operation after possible completion in 2015) for Duynefontein has been determined using a number of factors including the tide, storm surge and erosion, wave action and climate change, with wave run-up being the considered the dominant process. It has been noted that the coastline is sandy and that beach erosion is likely to be high, both along the coast as well as if the coastline is breached. In the latter scenario, flooding could occur behind the dunes immediately on the coast.

Primary and transverse dunes would be the most affected, with likely impacts on the functioning of the latter (Figure 5.1.3). However, part of the coastline is a raised beach located upon older Pleistocene calcretes and limestones and this is likely to reduce the impact of sea level rise to some extent.

The maximum predicted water surface elevation above mean sea level (amsl), taking climate change into account, is 11.2 m, 1.1 m above the present maximum. 1:100 year levels are shown in Figure 5.1.3.

5.1.3 Cumulative impacts

Impacts likely to be incurred in the long term and over the operational phase of the facility are chiefly those which would lead to loss of natural habitat fragmentation and in any way compromise ecosystem functioning. These include loss of the mobile and endemic transverse dunes and associated habitats. If more than one facility is constructed, then losses of transverse dunes habitat as well as impacts on the sand plain fynbos would increase. Approximately 230 ha in direct losses of habitat and ecosystem functioning would be likely to occur during construction of the NPS and associated infrastructure, and this would be reflected as a long-term and cumulative loss.

5.1.4 Positive impacts

The continued management of the Koeberg Nature Reserve, which entails the whole of the site outside the present NPS, is considered a positive impact. Current multiple-use of the reserve is extensive and management would continue with the new NPS. Extension of the reserve into good quality dune veld of the Groot Springfontein Farm to the mother is also highly desirable, and could be effected by a cooperative conservation agreement. All in all the use of some 200 to 280 ha for a NPS is far outweighed by the 3 000 ha currently under conservation within the Koeberg Nature Reserve.

5.1.5 Assessment of impacts

Assessment of impacts, with and without mitigation, is summarised in Table 5.1.1 (nuclear facility and spoil sites) and Table 5.1.2 (internal powerlines and access roads).

Impacts with medium to high significance for the nuclear facility after mitigation are: loss of habitat, ecosystem function and cumulative impacts.

Table 5.1.1: Impacts on botanical resources and dune ecology at Duynefontein: NPS and Spoil (revised February 2011)

Impact	*Intensity*	*Extent*	*Duration*	*Impact on irreplaceable resources*	*Consequence*	*Probability*	*SIGNIFICANCE*
Loss of habitat (present location)							
Impact 1: Loss of unvegetated and partially vegetated dune vegetation	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - footprint not to be relocated outside of transverse dune (no mitigation for loss of habitat)	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Loss of ecosystem function							
Impact 2: Loss of endemic transverse dune	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - footprint not to be relocated outside of transverse dune - (no mitigation for loss of transverse dune ecosystem function)	***Low***	***Low***	***High***	***High***	***Medium***	***High***	***Medium***
Loss of Red Data species							
Impact 3: Loss of locally occurring Red Data species	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - translocate or grow on affected species	***Low***	***Low***	***Low***	***Low***	***Low***	***Medium***	***Low***
Climate change (rise in sea level)							
Impact 4: Loss of coastal habitat/ possible impacts on NPS	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - coastal corridor and NPS setback from the coast	***Low***	***Low***	***Low***	***Medium***	***Low***	***Low***	***Low***
Cumulative impacts							
Impact 5: Loss of species, habitat and ecosystem functioning	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - relocate footprint outside of transverse dune (only part mitigation)	***Medium***	***Low***	***High***	***Medium***	***Medium***	***Medium***	***Medium***

Table 5.1.2: Impacts on botanical resources and dune ecology at Duynefontein: Powerlines and Access Roads (revised February 2011)

Impact	Intensity	Extent	Duration	Impact on irreplaceable resources	Consequence	Probability	SIGNIFICANCE
Impact 1: Loss of dune habitat	*High*	*Low*	*High*	*High*	*High*	*High*	*High*
Mitigated - align powerlines to avoid rare and sensitive dune habitat	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*
Impact 2: Loss of Red Data species	*High*	*Low*	*High*	*High*	*High*	*High*	*High*
Mitigated - locate bases of powerlines to avoid RD species	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*

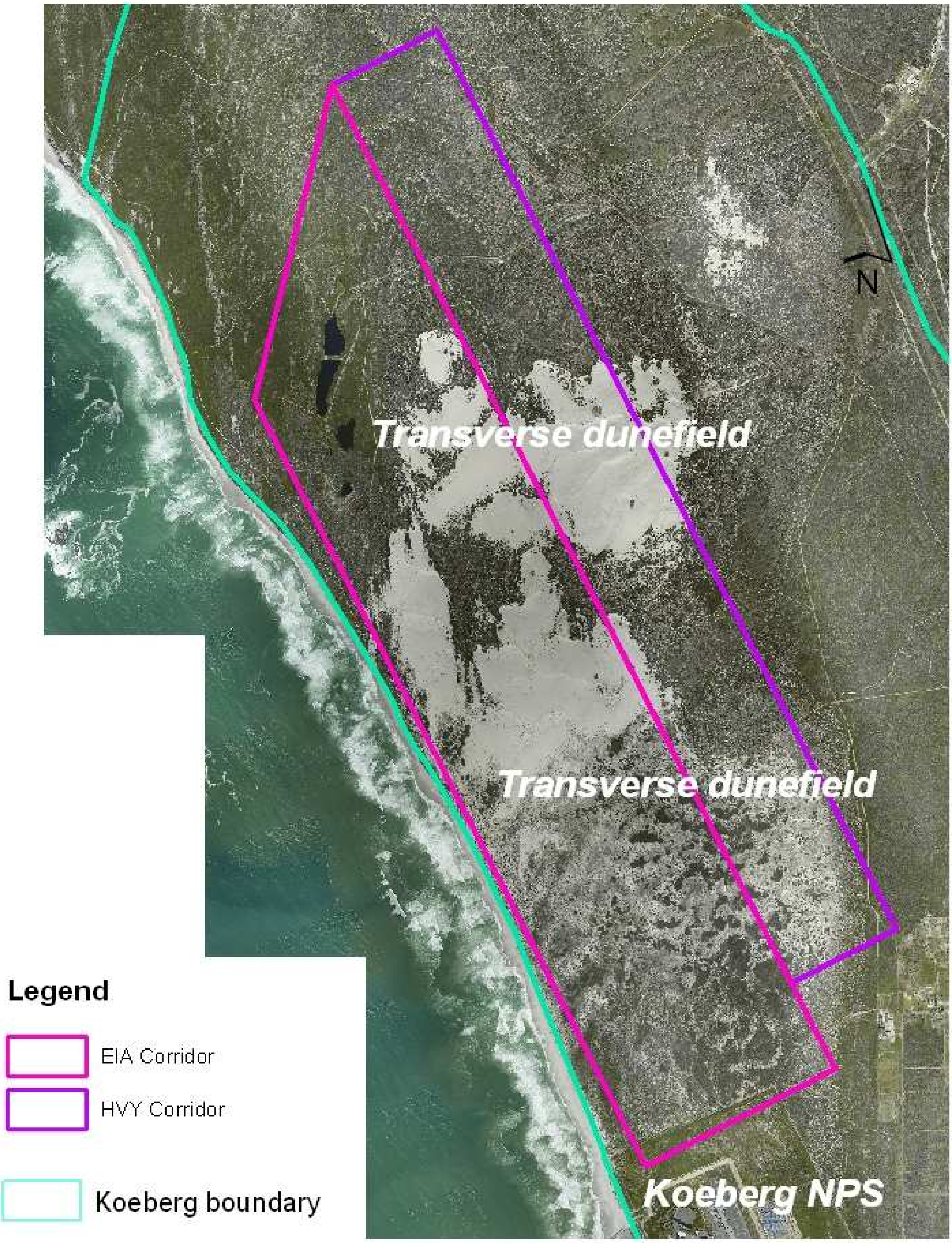


Figure 5.1.2. Location of proposed nuclear facility at Duynefontein and position of transverse dunes. Note that the present layout would lead to the loss of most of this endemic system. A possible alternative site would be to the east of the proposed HV yard footprint, in stable dune thicket

Figure 5.1.3. Predicted rise in sea level for Duynefontein coastline showing comparison with current level. Both primary and transverse dunes are highly susceptible to erosion. Levels after Prestedge et al. (2009)

5.1.6 Mitigation of impacts

(i) Size and location of NPS footprint

From the perspective of the dune systems and ecology at Duynefontein, the present position of the EIA corridor is ecologically unacceptable a) as it would lead to the loss of most of the rare and endemic transverse dune system in the area and b) is in the most sensitive part of the dune system, i.e. mobile and largely unvegetated dunes.

As a key mitigation measure, the layout should be moved to the east, away from the coast and avoiding the transverse dune system; this is dealt with further under the section on Coastal Corridor (Figure 5.1.4), below. A disturbed area around the existing conference facility and nature conservation offices would be suitable for a NPS facility, with additional land being added from the north (see Alternative siting in Figure 5.1.5 below).

(ii) Habitat fragmentation

Although the construction of a nuclear facility would probably not fragment the dunes, it would create a break in the northern coastal corridor at Duynefontein, notwithstanding a proposed coastal corridor of 200 m in width. Again, this has been dealt with under Coastal Corridor, below. Nevertheless any construction of structures associated with the facility should be consolidated where possible, to minimise fragmentation and thus reduce the compromising of ecosystem functioning (*sensu* Diamond, 1975).

(iii) Powerlines

Where possible, powerlines should be routed away from sensitive habitats and systems. These include the mobile transverse dunes and the transition between the transverse and parabolic dunes, and the acid sand plain fynbos, to the south-east of the planned facility. Number of pylons should be kept to a minimum (i.e. longer powerline spans used) and powerline supports where possible located in previously disturbed areas. Powerline servitudes can act as useful ecological corridors and conduits for pollinating and fruit-translocating fauna if the containing habitat is kept in acceptable condition and is ecologically functional. Likewise any service roads built under the powerlines should equally be directed away from rare habitats and species.

(iv) Search and rescue

For each phase of construction within natural veld, a search and rescue operation is required which would identify all plants which were either extremely rare (i.e. Endangered or Critically Endangered) or which could be used in site rehabilitation. Red Data species likely to be affected if development is carried out on the transverse dunes, are *Helichrysum cochleariforme* duineteebossie (Near Threatened - NT), *Psoralea repens* duine-ertjie (NT), the succulent vygie *Ruschia indecora* (Endangered - EN), and *Passerina ericoides* kusgonnabas (Vulnerable - VU) (Red Data status in brackets). Such RD species would require to be identified by a specialist botanist who would ensure a plan was in place to remove said plants **prior** to construction's commencing. Plants with a bulb or rootstock have the greatest chance of surviving translocation, whereas most shrubs and many of the graminoids (grasses, sedges, restios), particularly the obligate reseeders, would not translocate successfully. Seed and/or cuttings should be removed from species which will not translocate easily and grown on in the on-site nursery (see below).

(v) Rehabilitation plan

Linked with Search and Rescue above (iv) should be a rehabilitation plan which would see that all areas disturbed in the development of the proposed facility are satisfactorily rehabilitated with locally occurring indigenous species. This would include the collection of appropriate plant material prior to construction's commencing, the storage of such material and/or the growing on of suitable material. Plants would need to be at least two to three years old for use in rehabilitation and thus sampling should commence during the construction period, at least three years before commissioning of the NPS plant. A nursery which would accommodate stored and grown on plants would be an absolutely essential requirement for satisfactory rehabilitation. For this purpose a rehabilitation plan needs to be drawn up which will identify suitable species, method of storage and/or propagation, method of planting and maintenance, and monitoring of rehabilitation success (see below). This can be included as a part of the construction and operational EMP.

A comprehensive rehabilitation plan will require the services of a rehabilitation specialist together with a specialist botanist who would identify and locate suitable species; measures must be in place to ensure removal of said plants **prior** to construction's commencing. Seed and/or cuttings should be removed from species which will not translocate easily and grown on in the on-site nursery.

The plan should include the following key elements:

Preparation phase
At least two years before commencement of construction, an on-site nursery with manager needs to be set up at Duynefontein. A list of appropriate species needs to be drawn up and both seed and cuttings collected, planted out and suitably hardened off. This would provide material ready for planting as areas are required to be rehabilitated. In addition certain species could also be translocated into the nursery. The amount of plant material required would be guided by the extent of construction and areas to be disturbed. Both terrestrial and wetland habitats need to be considered.

A list of selected species suitable for rehabilitation can be found in Table 5.1.4.

Topsoil

This is perhaps the most critical part of rehabilitation and would determine to a great extent the ultimate success of any rehabilitation work.

- Topsoil (0 – 300 mm depth) should be removed from any area being disturbed temporarily or permanently, and stockpiled. Piles should be no more than 1.5 to 2 m high to avoid decrease in aeration, but also too rapid decomposition of organic matter, the latter essential for providing a good start for new plants.

- Stockpiles should be placed in previously disturbed areas and should definitely not be located on natural vegetation. This would lead to the death of the latter.

Planting

Planting of nursery-grown and -translocated species should be undertaken at a density set by the rehabilitation specialist, but generally at no less than 1 m apart. Time of planting should be just prior to the commencement of the rainy season in the Western Cape (April/May) so that plants are provided with good moisture conditions prior to the onset of the summer season some six months later.

Table 5.1.3. Selected plant species useful for rehabilitation at Duynefontein

Family	Species	Common name	Broad habitat	Form
Dicotyledones				
AIZOACEAE	*Tetragonia decumbens*	kinkelbossie	dunes	groundcover
ANACARDIACEAE	*Rhus crenata*	duinekraaibessie	dunes	Shrub
ANACARDIACEAE	*Rhus lucida*	blinktaaibos	dunes	Shrub
ASTERACEAE	*Arctotheca populifolia*	Sea pumpkin	Primary dunes	Groundcover
ASTERACEAE	Chrysanthemoides monilifera	bietou	dunes	Shrub
ASTERACEAE	*Didelta carnosa* subsp. *tomentosa*	seegousblom	Primary dunes	Low shrub
ASTERACEAE	*Metalasia muricata*	blombos	dunes	Shrub
EBENACEAE	*Euclea racemosa*	seeghwarrie	dunes	Shrub
ERICACEAE	Erica mammosa	ninepin heath	Sand plain	Shrub
FABACEAE	Otholobium bracteolatum	Skaapbostee	Dunes	Shrub
FABACEAE	Psoralea repens	duine-ertjie	Primary dunes	Groundcover
GERANIACEAE	Pelargonium capitatum	rose-scented pelargonium	dunes	Low shrub
LAMIACEAE	Salvia africana-lutea	Bruinsalie	Dunes	Shrub
MESEMBRYANTHEMACEAE	*Carpobrotus acinaciformis*	Sour fig	Dunes	Groundcover
POLYGALACEAE	Nylandtia spinosa	skilpadbessie	Sand plain and dunes	Shrub
RHAMNACEAE	*Phylica cephalantha*	tolhardeblaar	Sand plain	Shrub
RHAMNACEAE	*Phylica ericoides*		Dunes	Shrub
RUTACEAE	*Diosma hirsuta*	rooiboegoe	Sand plain and dunes	Shrub
THYMELAEACEAE	*Passerina corymbosa*	sandgonnabas	Sand plain	Shrub
Monocotyledones				
ARACEAE	*Zantedeschia aethiopica*	Arum lily	Sand plain and dunes	Bulb
ASPHODELACEAE	*Trachyandra divaricata*	duinekool	Dunes	Bulb
POACEAE	*Cladoraphis cyperoides*	Steekriet	Primary dunes	Grass
RESTIONACEAE	Elegia tectora	Olifantriet	Sand plain and dunes (wetter parts)	Restio
RESTIONACEAE	*Thamnochortus spicigerus*	duineriet	Dunes	Restio

Mulching

Mulch should be strewn over the planted areas and this should shade the soil, and provide a source of organic matter and some nutrients, as well as retention of moisture for new plants. The best source for mulch is locally occurring introduced acacias and these can be mulched on site after cutting. Care should be taken not to clear these woody aliens when they are setting seed (October-November for *Acacia saligna* Port Jackson willow).

Maintenance

Newly planted areas should be regularly weeded. Where plant death occurs, dead specimens should be replaced with material from the nursery. Plants should also be irrigated during the first summer season. For this purpose a simple above ground irrigation system would prove useful if not essential.

All woody aliens should be removed once they reach knee height (for ease of pulling).

(vi) Coastal corridor and buffers

The negative aspects of locating a nuclear facility at the coast (i.e. on the high water mark) have been discussed by Low (2008) for the proposed PBMR plant (since discounted as an option) and historically have existed for the Koeberg Nuclear Power Station. "These habitats are extremely sensitive and fragile and demand great circumspect if both the habitat as well as issues such as maintenance of structures are to be satisfactorily dealt with. A setback line should be implemented ......"

The EIA corridor should be separated from the high-water mark by a coastal corridor and adequate buffer to the sensitive mobile dunes, whichever is the greater. Such a corridor should be underpinned by the following ecological rules or criteria:

- 200 m wide ecological corridor as a minimum width for serving as a conduit for pollinating and fruit-translocating fauna and an enabling area for essential ecological processes, such as dune mobility and pollination, and preservation of major communities. At Duynefontein this will be far wider if recommendations for avoiding the sensitive, rare and endemic transverse dune system are upheld;
- Avoidance of the sensitive primary dunes at the coast;
- Avoidance of the sensitive limestone cliffs, in the north of the area;
- Whichever setback line is the furthest from the HWM, an additional buffer of 100 m should be set to protect the sensitive systems discussed above from any long-term impacts the development could have on such systems; and
- All setback lines would need to be accurately surveyed before the footprint was fine-tuned.

Figure 5.1.4 shows the various lines and the final setback for any development at the coast.

In summary, development is not recommended in the transverse dunes and, by implication, the sensitive primary dunes along the coast. Rather a setback 100 m inland of the eastern edge of the transverse dunes (Figure 5.1.4), recommends development on the flats to the east of the transverse dunes (see Figure 5.1.2).
A possible alternative location is shown in Figure 5.1.5. This locality is to the east of the transverse dune system and is found in parabolic dunes with far greater stability and lower rarity.

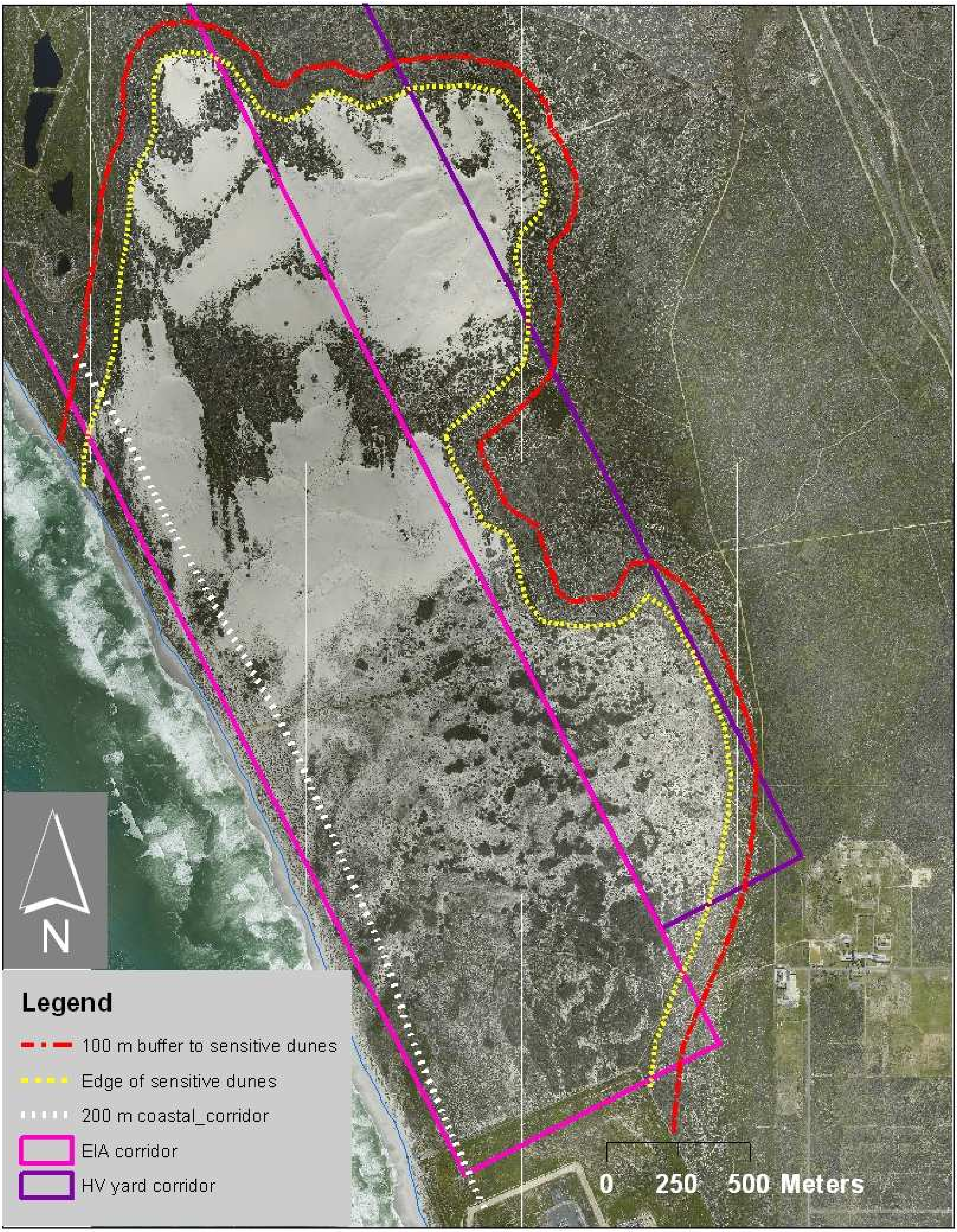


Figure 5.1.4. Coastal corridor and setback line for a nuclear facility at Duynefontein. The mobile transverse dune system should be avoided and any facility located to the east of the dunes buffer

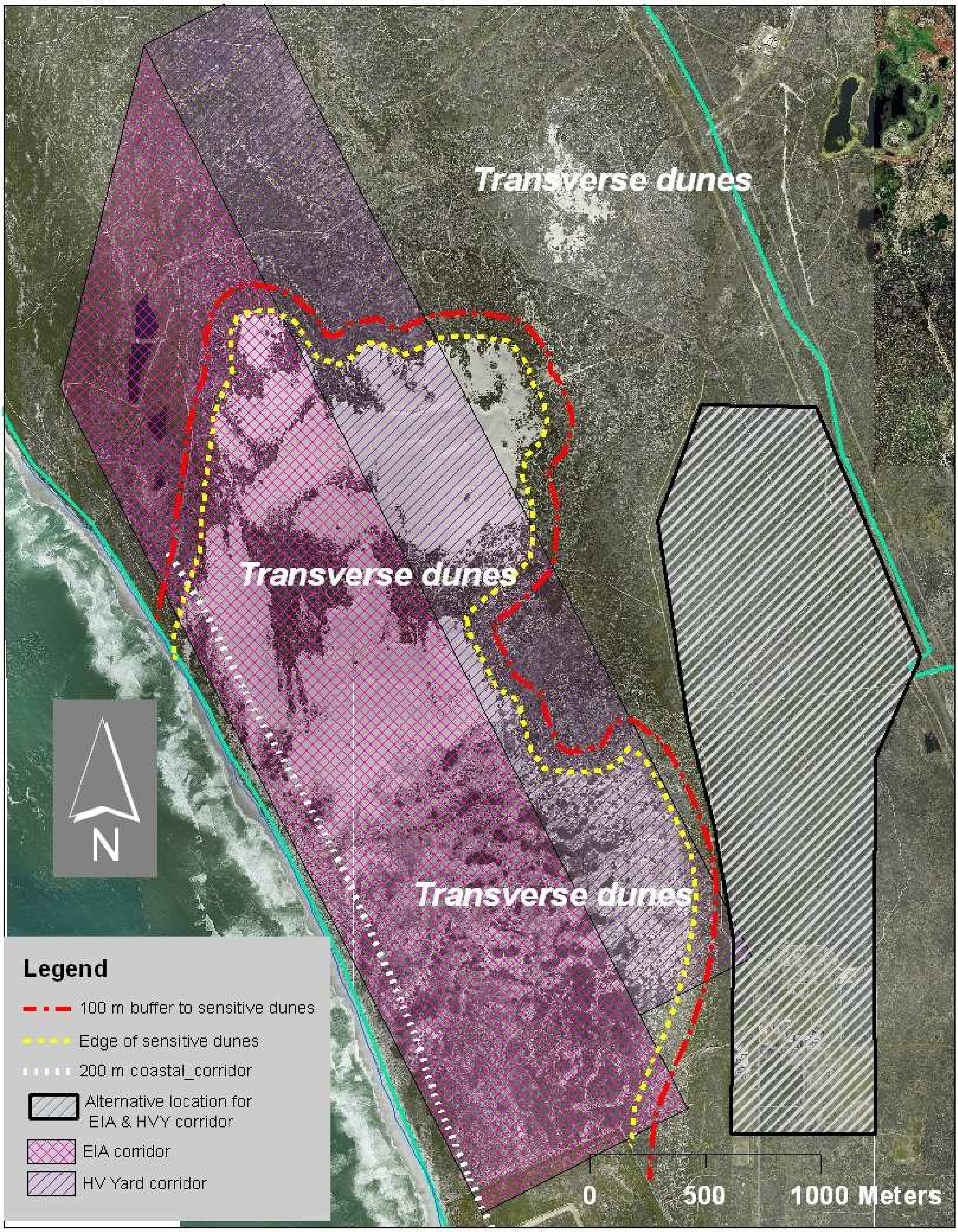


Figure 5.1.5. Alternative siting for Duynefontein NPS EIA & HV Yardcorridor. This locality avoids the sensitive and endemic mobile and vegetated transverse dune system and would be located in stable, less rare parabolic dunes

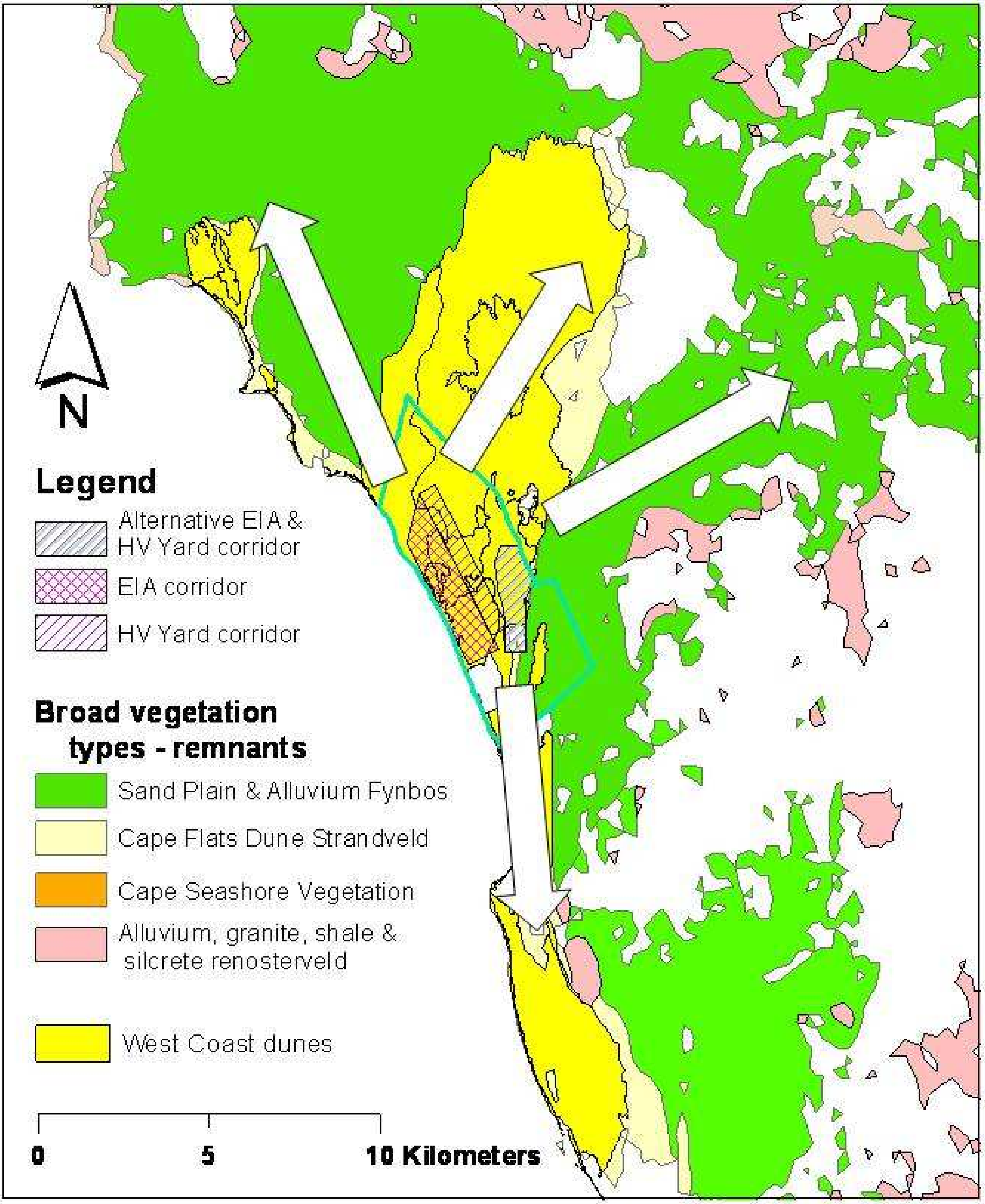


Figure 5.1.6. Linkages between Duynefontein to the south and north along the West Coast, as well as inland. Location of a NPS facility in the present site will have a major negative impact on the corridor along the West Coast

(vii) Inlet and outlet pipes

The use of inlet and outlet pipes for the intake and removal of sea water as coolant and for the brine for the nuclear facility is strongly supported (as opposed to the current intake and outlet system operating at the Koeberg NPS), but with the following provisos:

- Both sets of pipes should be buried to a minimum depth of 2 to 3 m where possible and should not be exposed at the coast; in the case of the NPS's being relocated to east of the transverse dunes, all pipes should be routed to avoid the transverse dune system, and brought to the south, in disturbed land just north of the present NPS;
- Topsoil should be removed and stockpiled as described above;
- Where pipes are to be placed, excavation should be preceded by a search and rescue operation as discussed above. All useful and rare plants should be removed and stored and/or grown on in the site nursery; and
- Once excavation and filling is completed, rehabilitation should be carried out.

(viii) Spoil sites

In any excavation and removal of material, the topsoil (minimum 300 mm) should be stored for later use in rehab. Exact methods for this should be detailed in the construction EMP, but piles should not be higher than 1.5 to 2 m to provide aeration. All excess fill material should be removed from the site.

Where smaller amounts of fill are involved, such as from the inlet and outlet pipes, this could be stored locally but in a previously disturbed locality (-es). Again, topsoil must be separated from the general fill and stored appropriately, as discussed above.

(ix) Cumulative impacts

To avoid cumulative impacts on habitat and rare species loss, and ecosystem functioning, footprints must be amended to minimise effects on local natural habitats. Rehabilitation – as described above - should be undertaken in all disturbed sites so that long term benefits to habitat quality and general ecosystem functioning are enhanced.

5.1.7 Monitoring

(i) Rehabilitation

Goal: to ensure that rehabilitation with indigenous species is carried out effectively and has long-term sustainability

a Uninvaded areas

Where habitats have been unnaturally disturbed but are not invaded by *Acacia cyclops* rooikrans, rehabilitation with indigenous species is to be implemented. Such rehabilitation must follow a plan put together by a rehabilitation specialist, assisted by a specialist botanist with a good working knowledge of the local flora, and using locally occurring indigenous species. Details of the plan are presented in section (v) above. Rehabilitation success must be monitored on a three monthly basis for the first year, and then six monthly until acceptable species densities and cover are achieved.

b Invaded areas

Areas invaded by *Acacia cyclops* rooikrans or *Acacia saligna* Port Jackson willow should be cleared and rehabilitated as per the recommendations in (v) above. Rehabilitation should only be implemented if thicket species do not naturally return to a desired cover and species complement. The latter two factors should be monitored by a specialist botanist and targets set for both these two criteria; this should be included in the rehabilitation plan.

Whilst it is strongly recommended that rooikrans be cleared manually – for both social as well as ecological reasons – individuals removing acacias should be subject to a code of conduct which would govern behaviour on site. Key issues would include damage to plants and animals, toilets, fire, and general behaviour to be consistent with that of a nature reserve. Activities of these individuals need to be monitored by the on-site supervisor or conservation manager (see below).

(ii) Coastal corridor

Goal: to ensure a coastal corridor is created in an appropriate manner and is maintained in the long-term

Implementation of a coastal corridor (see section (vi) above and corridor model in Figure 5.1.4) must be a key goal of the development of the nuclear facility. Monitoring must be implemented to ensure that the coastal corridor is maintained in as natural a state as possible. This would include monitoring the rehabilitation of areas which have been excavated for the inlet and outlet pipes and the area immediately alongside the nuclear structure. Rehabilitation with indigenous species should be undertaken following the rehabilitation plan discussed above.

Institution of a functional coastal corridor is closely allied with the re-siting of the EIA corridor (Figure 5.1.5).

(iii) Relocation and/or growing on of Red Data species

Goal: to ensure that where possible all Red Data species affected by development are relocated or successfully grown on in a nursery and returned to the wild.

Relocation and/or growing on of Red Data species should be included in the site's rehabilitation plan. Key performance criteria include the reintroduction of RD species into protected areas, either on the site or in nearby nature reserves, or the growing on of such species for introduction into natural habitats through the rehabilitation plan. The bottom line would be to ensure there would not be a reduction in the natural densities and populations in each RD species.

(iv) State of conservation area

Goal: to ensure that the natural areas of Duynefontein/Koeberg Private Nature Reserve are maintained in a state consistent with that of a well-managed nature reserve

Koeberg should continue with its appointment of a conservation manager who would ensure that a management plan for the area is implemented. Key performance areas would be: woody alien eradication, rehabilitation, creation of a trail system for the public, control of access and use of the area, control of vehicles entering the area.

5.2 Bantamsklip

5.2.1 Negative impacts

Only impacts associated with the construction of one NPS and one HV Yard are considered here, and not the whole EIA corridor. The impact assessment maps nevertheless provide a good basis from which to prioritise the least sensitive and rare areas for such construction to occur.

a Loss of habitat and species

(i) Nuclear power station and HV Yard

Extent of the proposed EIA corridor and HV Yard comprises some 322 and 207 ha respectively (calculated from shape files using ArcMap), with the NPS and associated infrastructure likely to be in the order of 230 ha (see Figure 5.2.1).

Vegetation type

Virtually all of the EIA corridor and HV Yard comprises the Least Threatened (i.e. **low** rarity***)*** vegetation type, Overberg Dune Strandveld (Rouget *et al*., 2004) (Figure 5.2.1a and also Figures 4.2.3 and Appendix 4.2.6). Such loss will be locally significant and permanent.

Habitat

Most of the footprint would be located in habitat of **very low** rarity (transverse dunes – Community BK4) and **low** rarity (coastal sand fynbos – Community BK8). An area of **high** rarity (coastal limestones) (Community BK9), would be affected in the south-east of the footprint (Figure 5.2.1b and also Figure 4.2.7 and Appendix 4.2.6). Such loss would be permanent but localised.

Species rarity (unweighted)

All phases are located in habitat which either has no Red Data species, or has **low** to **medium** rarity (Figure 5.2.1c and also Appendix 4.2.6). Red Data species losses would be localised and permanent.

Species rarity (weighted)

Weighted species rarity is lower than the above, with either **no** rarity at the coast or **low** rarity further inland (Figure 5.2.1d and also Appendix 4.2.6). Red Data species losses are as above.

The following Red Data species are potentially affected (see Table 4.2.5): *Agathosma geniculata (*Near Threatened - NT)*, Asparagus stipulaceus (*NT)*, Diosma awilana* (Vulnerable - VU)*, Helichrysum cochleariforme* duineteebossie (NT), the succulent shrub *Lampranthus fergusoniae* (VU)*, Manulea caledonica* (NT)*, Psoralea repens* duine-ertjie (NT), *Satyrium carneum* rooitrewwa (NT), *Selago diffusa* (VU)*, Senecio pillansii* (NT)*,* the sedge *Tetraria brachyphylla* (NT)and the restio *Thamnochortus fraternus* (NT).

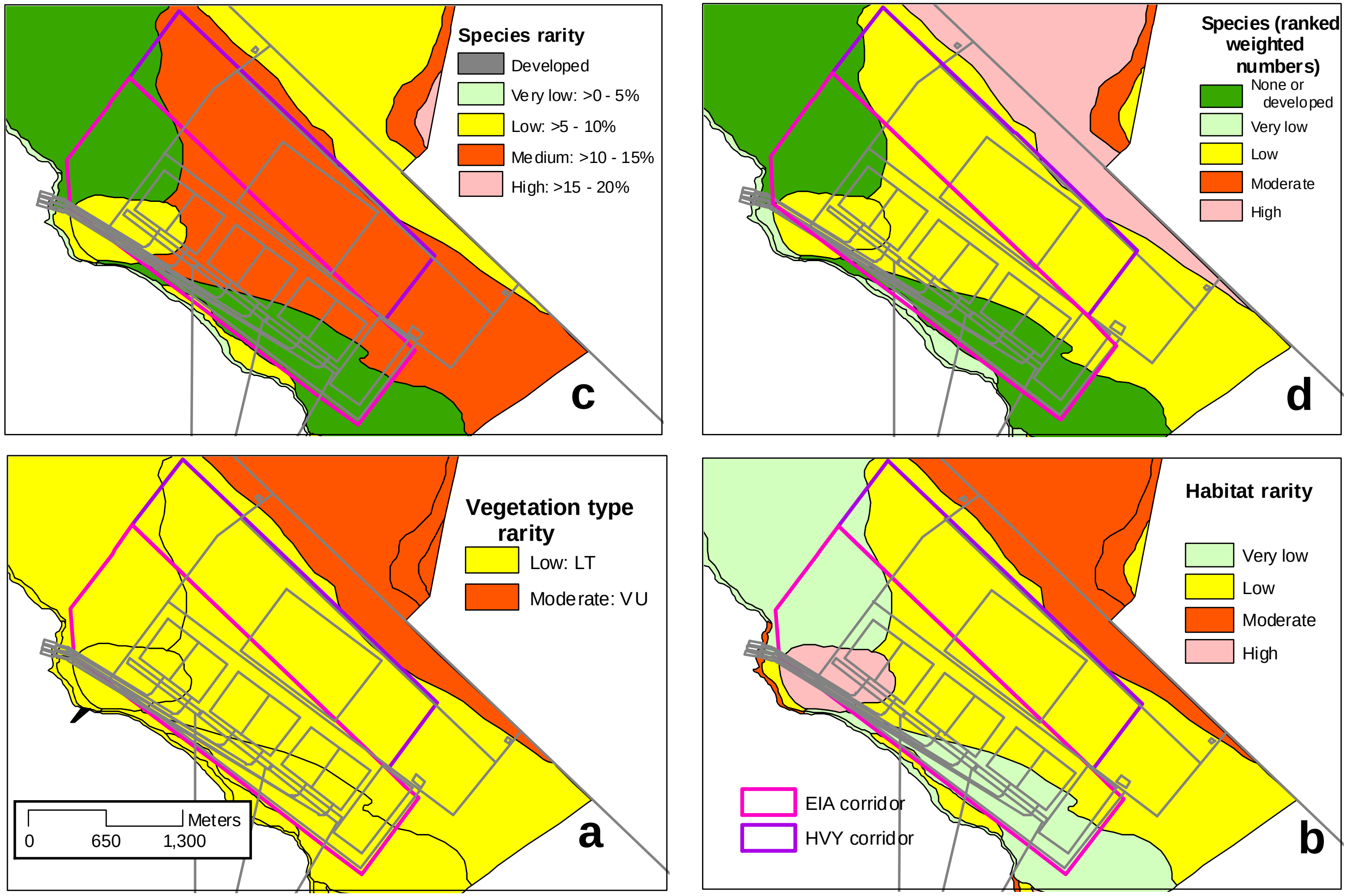


Figure 5.2.1. Impacts associated with proposed footprints for a nuclear power station at Bantamsklip. a: vegetation type rarity; b: habitat rarity; c: % species rarity (unweighted); d: weighted species rarity

(ii) Spoil sites

It is estimated that some ***10.073*** million m^3 of sand and a further ***1.199*** million m^3 of bedrock will need to be removed for construction of the NPS (figures supplied by Eskom). Excavation for a NPS causes a number of major impacts:

a) stockpiling of spoil elsewhere on the site or preferably off site

b) dealing with such spoil, as only ***1.892*** million m^3 will be used as backfill and possible landscaping on site, and

c) linked with excavation activity is the operation of plant as well as transport of material away from the site.

All of the above would cause potential impacts through loss of and damage to natural vegetation and Red Data species (locally) to excavation and road construction, and would have major implications for rehabilitation. Indirect impacts would result from dust in both the excavation as well as during transporting of spoil.

However, assuming previously disturbed sites are used, then impacts on vegetation type, habitat and Red Data species would be low (see under Rehabilitation, below).

b Loss of ecosystem function

(i) Nuclear power station and HV Yard

Construction of the power station within the proposed corridor could lead to the loss of partially stable transverse and stable deflated parabolic dunes. Both these dune systems are well-represented along this coastline (see Figure 4.2.12). The transverse dunes at Bantamsklip are severely impacted by invasive *Acacia cyclops* rooikrans, and these have artificially stabilised much of this naturally mobile system (Figure 5.2.2 and see Figure 4.2.3). However, construction on the eastern end of the western transverse dune system could lead to management challenges in the longer-term, as natural dune movement would still be eastwards.

Loss of ecosystem function within the Coastal Sand Fynbos (Community BK8) on deflated parabolic dunes (Figure 4.2.12) is probably low, as large, connected tracts of this system would still remain intact post-construction, to the east and west of the site.

The construction could also potentially impact on and compromise the functioning of the rare coastal limestones (Figure 4.2.7 and Appendix 4.2.6)

5.2.2 Climate change

A 1:100 year sea level floodline has been determined for Bantamsklip (see Prestedge *et al.,* 2009), using a number of factors including the tide, storm surge and erosion, wave action and climate change, with wave run-up being the considered the dominant process. It has been noted that the coastline is sandy and that beach erosion is likely to be high, both along the coast as well as if the coastline is breached. In the latter scenario, flooding could occur behind the dunes immediately on the coast.

Primary and transverse dunes would be the most affected, with likely impacts on the functioning of both (Figure 5.2.3). However the rocky shore and coastal limestones would also suffer impacts from the predicted sea level rise.

The maximum predicted water surface elevation above mean sea level (amsl), taking climate change into account, is 10.8 m, 1.4 m above the present maximum. 1:100 year levels are shown in Figure 5.2.3.

5.2.3 Cumulative impacts

Impacts likely to be incurred in the long term and over the operational phase of the facility will include those which fragment and in any way compromise ecosystem functioning. This applies in particular to the transverse dune systems and coastal limestones. If additional units are constructed then losses of transverse dune habitat would probably increase with impacts on the western and eastern TD systems likely to occur.

5.2.4 Positive impacts

The conservation importance of the Bantamsklip area has been addressed in the botanical and dunes ecological assessment above. Whilst the dune systems are fairly well-represented and -conserved along the coastline between Hermanus and Cape Agulhas (Figure 4.2.2), the inland systems have demonstrated even higher rarity and greater conservation importance (Cowling *et al*., 1988b; Cowling, 1996; and *sensu* Cowling *et al*., 1999; Cole *et al*., 2000).

The inland systems are on the whole poorly conserved (*sensu* Rouget *et al*., 2004) (Agulhas Limestone Fynbos – 7.5%; Overberg Dune Strandveld – 30%; Cape Lowland Freshwater Wetlands – 16%; Overberg Sandstone Fynbos – 6%; Agulhas Sand Fynbos – 6.5%). The figures speak for themselves and it is clear that any additions to those vegetation types with <10% protected would make significant contributions to conservation in the region.

If a nuclear facility is built at Bantamsklip it would bring some 2 300 ha (the balance of the site after construction of a NPS occupying a relatively small area of 200 to 280 ha) of protected natural vegetation to the western Agulhas Plain. The extent of each community, and therefore an indication of the proportion each would contribute to the broader conservation status of the region, is shown in Table 4.2.2.

If Eskom follows the example of Duynefontein (Koeberg Private Nature Reserve), a similar reserve could be created here. However, as stated above, this form of conservation area has no permanent tenure. If a nuclear facility is built at Bantamsklip, then a nature reserve that would provide permanency to such a conservation endeavour would need to be created. This reserve would therefore need to be effective for both the lifespan of the power station as well as after the decommissioning phase. In short, Eskom would need to retain ownership of the land in perpetuity, or the land would need to be handed over to a conservation body such as CapeNature or SA National Parks, both of whom manage conservation areas along the Agulhas Plain coastline.

The Western Cape Provincial guidelines for biodiversity offsets (Brownlie, 2007) suggest such offsets should be applied for net loss of quality habitat on site and that a developer would need to acquire additional good quality habitat as an offset to that lost on his/her particular site. However, the guidelines do provide for “on site off sets” whereby the loss of habitat could be made good by providing conservation land on the same site. This would apply in the case of Bantamsklip.

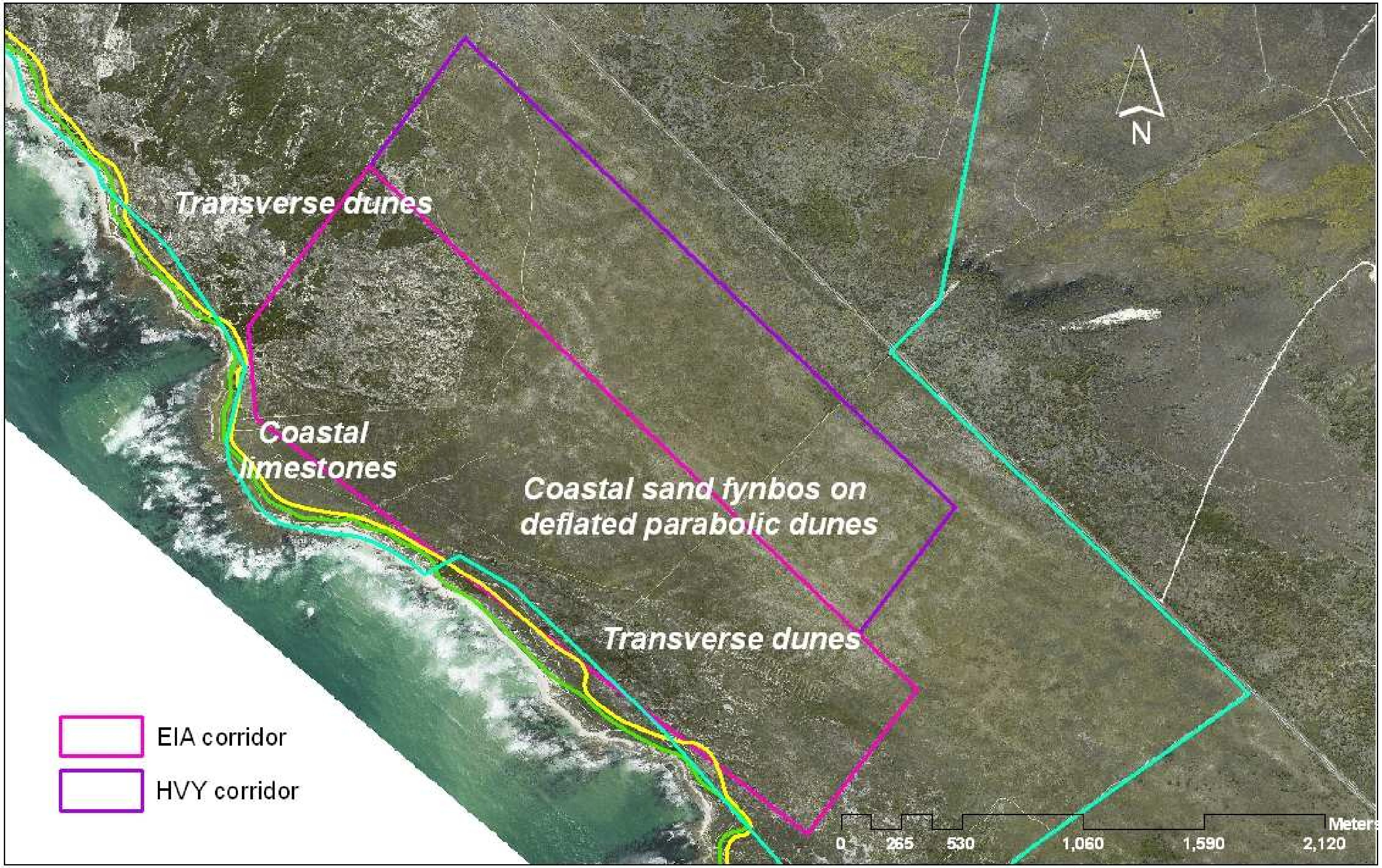


Figure 5.2.2. Location of planned nuclear facility footprint in relation to coastal habitats at Bantamsklip. Note proximity to or overlap with transverse dunes and coastal limestones

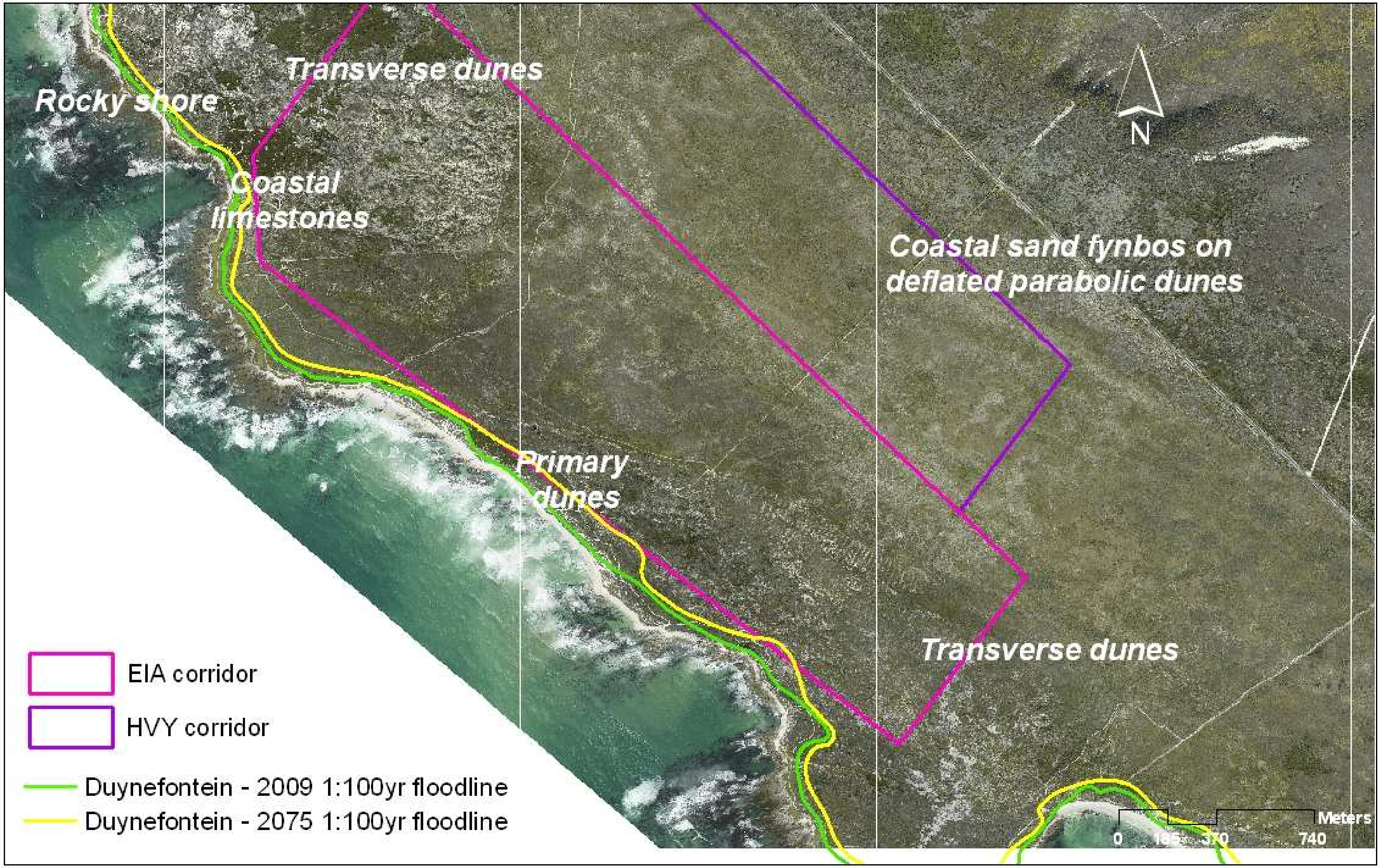


Figure 5.2.3. Predicted rise in sea level for Bantamsklip coastline showing comparison with current level. Both primary and transverse dunes are highly susceptible to erosion, but rise in sea level will also impact the rocky shore and coastal limestones

5.2.5 Assessment of impacts

Assessment of negative impacts, with and without mitigation, is presented in Table 5.2.1 (nuclear facility, HV Yard and spoil site).

There are no significant impacts for the nuclear power station after mitigation.

Table 5.2.1: Impacts on botanical resources and dune ecology at Bantamsklip: NPS and Spoil (revised February 2011)

Impact	Intensity	Extent	Duration	Impact on irreplaceable resources	Consequence	Probability	SIGNIFICANCE
Loss of habitat - coastal sand fynbos							
Impact 1: Loss of coastal fynbos	*Medium*	*Low*	*High*	*High*	*High*	*High*	*Medium*
Mitigated - move footprint (no direct mitigation for loss of habitat)	*Low*	*Low*	*Medium*	*Low*	*Low*	*Low*	*Low*
Loss of habitat - coastal limestone fynbos							
Impact 2: loss of limestone fynbos	*High*	*Low*	*High*	*High*	*High*	*High*	*High*
Mitigated - move footprint (no direct mitigation for loss of habitat)	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*
Loss of transverse dunes							
Impact 3: loss of semi-mobile transverse dunes	*Medium*	*Low*	*High*	*Medium*	*Medium - High*	*High*	*Medium*
Mitigated - move footprint (no direct mitigation for loss of habitat)	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*
Loss of ecosystem function							
Impact 4: Loss of transverse dune function	*High*	*Low*	*High*	*Medium*	*Medium - High*	*High*	*Medium*
Mitigated - move footprint	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*
Loss of Red Data species							
Impact 5: Loss of locally occurring RD species	*High*	*Low*	*High*	*High*	*High*	*High*	*High*
Mitigated - move footprint; translocate or grow on affected species)	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*
Climate change (rise in sea level)							
Impact 6: Loss of coastal habitat/ possible impacts on the NPS	*High*	*Low*	*High*	*High*	*High*	*High*	*High*
Mitigated - coastal corridor and setback from coast	*Low*	*Low*	*Low*	*Low*	*Medium*	*Low*	*Low*
Cumulative impacts							
Impact 7: loss of species, habitat and ecosystem functioning	*High*	*Low*	*High*	*High*	*High*	*High*	*High*
Mitigated - locate footprint away from transverse dunes and coastal limestones	*Low*	*Low*	*Low*	*Low*	*Low - Medium*	*Low*	*Low*

5.2.6 Mitigation of impacts

(i) Size and location of NPS footprint

It is assumed that the current EIA and HV Yard corridors are proposed and can be subjected to fine-tuning relative to the constraints of the natural environment. For Bantamsklip, the coastal limestones should be avoided and if possible, although not essential, the transverse dunes. The latter is more a case of avoiding a sensitive system rather than rare, but there would be major implications for management if a mobile system abuts the planned facility. The footprint should be amended to avoid the coastal limestones and preferably the transverse dunes – see Coastal Corridor (Figure. 5.2.4) below.

(ii) Habitat fragmentation

Where rare habitat stands to be lost, every effort should be made to adjust development footprints so that such habitat is avoided or loss is minimised. Habitats should not be fragmented as this leads to reduced viability, mainly due to decrease in size, and where shape becomes linear as opposed to round (*sensu* Diamond, 1975). Habitat connectivity should also be maintained. In this way compromising of ecosystem function would be minimised.

(iii) Powerlines

Internal powerlines should not cross the rare and sensitive natural vegetation in the north of the site. Rather they should be routed away from such habitats and where possible placed along the outside of the area. Where location in natural veld is unavoidable, number of pylons should be kept to a minimum (e.g. longer spans used) and powerline supports located in previously disturbed areas where possible. Correspondingly, powerline servitudes could act as useful ecological corridors and conduits for pollinating and fruit-translocating fauna if the containing habitat is kept in acceptable condition and is ecologically functional. Likewise any service roads built under the powerlines should equally be directed away from rare habitats and species.

(iv) Search and rescue

For each phase of construction within natural veld, a search and rescue operation is required which would identify all plants which were either extremely rare (i.e. Endangered or Critically Endangered) or which could be used in site rehabilitation. Red Data species which could be affected by the proposed NPS are: *Agathosma geniculata* (Near Threatened - NT), *Asparagus stipulaceus* (NT), *Capnophyllum africanum* (NT), *Diosma awilana* (Vulnerable - VU), *Helichrysum cochleariforme* duineteebossie (NT), the vygie *Lampranthus fergusoniae* (VU), *Manulea caledonica* (NT), *Roepera fuscata* (VU) and *Satyrium carneum* rooitrewwa (NT) (Red Data status in brackets). This would require the services of a specialist botanist to identify and locate suitable species and to ensure a plan is in place to remove said plants **prior** to construction's commencing. Plants with a bulb or rootstock have the greatest chance of surviving translocation, whereas most shrubs and many of the graminoids (grasses, sedges, restios), particularly the obligate reseeders, would not translocate successfully. Seed and/or cuttings should be removed from species which would not translocate easily and grown on in the on-site nursery.

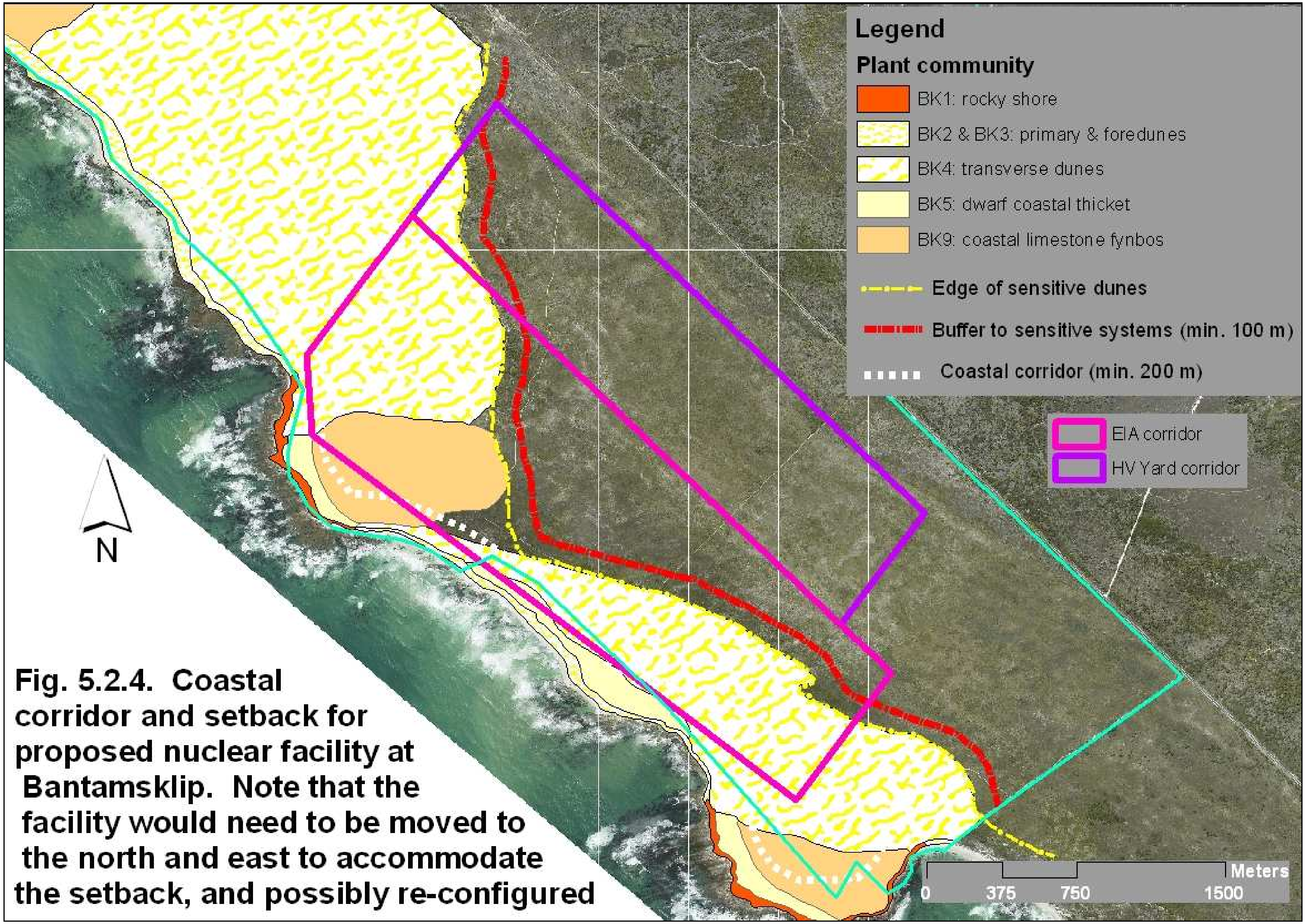


Fig. 5.2.4. Coastal corridor and setback for proposed nuclear facility at Bantamsklip. Note that the facility would need to be moved to the north and east to accommodate the setback, and possibly re-configured

5-31

(v) Rehabilitation plan

Linked with Search and Rescue above (iv) should be a rehabilitation plan which would see that all areas disturbed in the development of the proposed facility were satisfactorily rehabilitated with locally occurring indigenous species. This would include the collection of appropriate plant material prior to construction's commencing, the storage of such material and/or the growing on of suitable material. Plants would need to be at least two to three years old for use in rehab and thus sampling should commence during the construction period, at least three years before commissioning of the NPS plant. A nursery which would accommodate stored and grown on plants would be an absolutely essential requirement for satisfactory rehabilitation. For this purpose a rehabilitation plan needs to be drawn up which would identify suitable species, method of storage and/or propagation, method of planting and maintenance, and monitoring of rehabilitation success (see below). This should be included as a part of the **construction** and **operational** EMP.

A comprehensive rehabilitation plan would require the services of a rehabilitation specialist together with a specialist botanist who would identify and locate suitable species; measures should be in place to ensure removal of said plants **prior** to construction's commencing. Plants with a bulb or rootstock have the greatest chance of surviving translocation, whereas most shrubs and many of the graminoids (grasses, sedges, restios), particularly the obligate reseeders, would not translocate successfully.

Seed and/or cuttings should be removed from species which would not translocate easily and grown on in the on-site nursery.

The plan should include the following key elements:

Preparation phase

At least two years before commencement of construction, an on-site nursery with a manager needs to be set up at Bantamsklip. A list of appropriate species needs to be drawn up and both seed and cuttings collected, planted out and suitably hardened off. This would provide material ready for planting as areas require to be rehabilitated. In addition certain species could also be translocated into the nursery. The amount of plant material required would be guided by the extent of construction and areas to be disturbed. Both terrestrial and wetland habitats need to be considered.

A list of selected species suitable for rehabilitation is found in Table 5.2.2.

Topsoil

This is perhaps the most critical phase and will determine to a great extent the ultimate success of any rehabilitation work.

- Topsoil (0 – 300 mm depth) should be removed from any area being disturbed temporarily or permanently, and stockpiled. Piles should be no more than 1.5 to 2 m high to avoid loss of aeration, but also too rapid decomposition of organic matter, the latter essential for providing a good start for new plants

- Stockpiles should be placed in previously disturbed areas and should definitely not be located on natural vegetation. This would lead to the death of the latter

Table 5.2.2. Selected plant species useful for rehabilitation at Bantamsklip

Family	Species	Common name	Broad habitat	Form
Dicotyledones				
AIZOACEAE	*Tetragonia decumbens*	kinkelbossie	dunes	groundcover
ANACARDIACEAE	*Rhus lucida*	blinktaaibos	dunes	Shrub
ASTERACEAE	*Arctotheca populifolia*	Sea pumpkin	Primary dunes	Groundcover
ASTERACEAE	Chrysanthemoides monilifera	bietou	dunes	Shrub
ASTERACEAE	*Metalasia muricata*	blombos	dunes	Shrub
EBENACEAE	*Euclea racemosa*	seeghwarrie	dunes	Shrub
ERICACEAE	*Erica coccinea*	vlakteheide	Coastal limestone and sands	shrub
FABACEAE	Otholobium bracteolatum	Skaapbostee	Dunes	Shrub
FABACEAE	Psoralea repens	duine-ertjie	Primary dunes	Groundcover
GERANIACEAE	*Pelargonium capitatum*	Rose-scented pelargonium	Dunes	Low shrub
LAMIACEAE	Salvia africana-lutea	Bruinsalie	Dunes	Shrub
MESEMBRYANTHEMACEAE	*Carpobrotus acinaciformis*	Sour fig	Dunes and coastal limestones	Groundcover
MESEMBRYANTHEMACEAE	*Mesembryanthemum vanrensburgii*	seepampoen	Rocky shore and primary dunes	groundcover
POLYGALACEAE	*Muraltia satureioides*	skilpadbos	Dunes and coastal limestones	shrub
POLYGALACEAE	Nylandtia spinosa	skilpadbessie	Dunes and coastal limestones	Shrub
PROTEACEAE	*Leucadendron coniferum*	geeltolbos	Coastal sands	Shrub
RHAMNACEAE	*Phylica ericoides*		Dunes	Shrub
RUTACEAE	*Agathosma geniculata*		Dunes and coastal limestones	Shrub
THYMELAEACEAE	*Passerina corymbosa*	sandgonnabas	Coastal sands	Shrub
THYMELAEACEAE	*Passerina rigida*	duinegonnabas	dunes and coastal limestones	shrub
Monocotyledones				
ARACEAE	*Zantedeschia aethiopica*	Arum lily	Sand plain and dunes	Bulb
ASPHODELACEAE	*Trachyandra divaricata*	duinekool	Dunes	Bulb
CYPERACEAE	*Tetraria brachyphylla*		Coastal sands	sedge
POACEAE	*Ehrharta villosa* subsp. *villosa*	pypgras	Primary dunes and coastal sands	Grass
RESTIONACEAE	Elegia tectora	Olifantriet	Sand plain and dunes (wetter parts)	Restio
RESTIONACEAE	*Thamnochortus erectus*	wyfieriet	Dunes and Coastal sands	Restio

Planting

Planting of nursery-grown and -translocated species should be undertaken at a density set by the rehabilitation specialist, but generally at no less than 1 m apart. Time of planting should be just prior to the rainy season in the Western Cape (April/May) so that plants are provided with good moisture conditions prior to the onset of the summer season some six months later.

Mulching

Mulch should be strewn over the planted areas and this should shade the soil, and provide a source of organic matter and some nutrients, as well as retention of moisture for new plants. The best source for mulch is locally occurring introduced acacias (*Acacia cyclops* rooikrans; *A.saligna* Port Jackson willow) and these can be mulched on site after cutting. Care should be taken not to clear these woody aliens when they are setting seed (October-November).

Maintenance

Newly planted areas should be regularly weeded. Where plant death occurs, new material should be planted out. Plants should also be irrigated during the first summer season. For this purpose a simple above ground irrigation system would prove useful if not essential.

All woody aliens should be removed once they reach knee height (for ease of pulling).

(vi) Coastal corridor and buffers

The negative aspects of locating a nuclear facility at the coast (i.e. on the high water mark) have been discussed by Low (2008) for the now discontinued PBMR plant at Koeberg. In that study Low (2008) stated: “These habitats are extremely sensitive and fragile and demand great circumspect if both the habitat as well as issues such as maintenance of structures are to be satisfactorily dealt with. A setback line should be implemented ......”

The EIA corridor should be separated from the high-water mark by a coastal corridor and adequate buffer to the sensitive primary and foredunes, limestones and rocky shore habitat at the coast, whichever is the greater. Such a corridor should be underpinned by the following ecological rules or criteria:

- 200 m wide ecological corridor as a minimum width for serving as a conduit for pollinating and fruit-translocating fauna and an enabling area for essential ecological processes, such as dune mobility, pollination, and preservation of major communities;
- Avoidance of the embryo dunes and rocky shore vegetation;
- Avoidance of the coastal limestones;
- Whichever line is the furthest from the HWM, an additional buffer of 100 m should be set to protect the sensitive systems discussed above from any long-term impacts the development could have on such systems; and
- All lines will need to be accurately surveyed before the footprint is fine-tuned.

Figure 5.2.4 shows the coastal corridor and the final setback for any development on the Bantamsklip coast. It is likely the present configuration would not “fit” between the recommended coastal setback line and the Gansbaai road, and the present footprint would therefore require amending, with relocation further inland and slightly east of its currently proposed siting (see Figure 5.2.5).

The importance of keeping a 200 m wide conduit along the coast is illustrated in Figure 5.2.6, as is the use of the alternative siting of the EIA/HVY corridor. In this way functional linkages could be maintained along the coast, as well as inland.

(vii) Inlet and outlet pipes

The use of inlet and outlet pipes for the intake and removal of sea water as coolant and brine for the nuclear facility is strongly supported, but with the following provisos:

- Both sets of pipes should be buried to a minimum depth of 2 to 3 m where possible and should avoid the rocky shore and coastal limestones;
- Where pipes are to be placed, excavation should be preceded by a search and rescue operation as discussed above. All useful and rare plants should be removed and stored and/or grown on in the site nursery;
- Topsoil should be removed and stockpiled as described above; and
- Once excavation and filling is completed, rehabilitation should be carried out.

(viii) Spoil sites

In any excavation and removal of material, the topsoil (0 - 300 mm) should be stored for later use in rehabilitation. Piles should be no higher than 1.5 to 2 m to provide aeration, and should be located on previously disturbed parts.

All fill material required for post-construction infilling and general landscaping should be stored on site, as long this occurs in previously disturbed areas. Excess fill should be removed from the site.

Where smaller amounts of fill are involved, such as from the inlet and outlet pipes, this could be stored locally but in a previously disturbed locality (-es). Again, topsoil must be separated from the general fill and stored as recommended above, as discussed above.

(ix) Cumulative impacts

To avoid cumulative impacts on habitat and rare species loss, and ecosystem functioning, footprints must be amended to minimise effects on local natural habitats. Rehabilitation – as described above - should be undertaken in all disturbed sites so that long term benefits to habitat quality and general ecosystem functioning are enhanced.

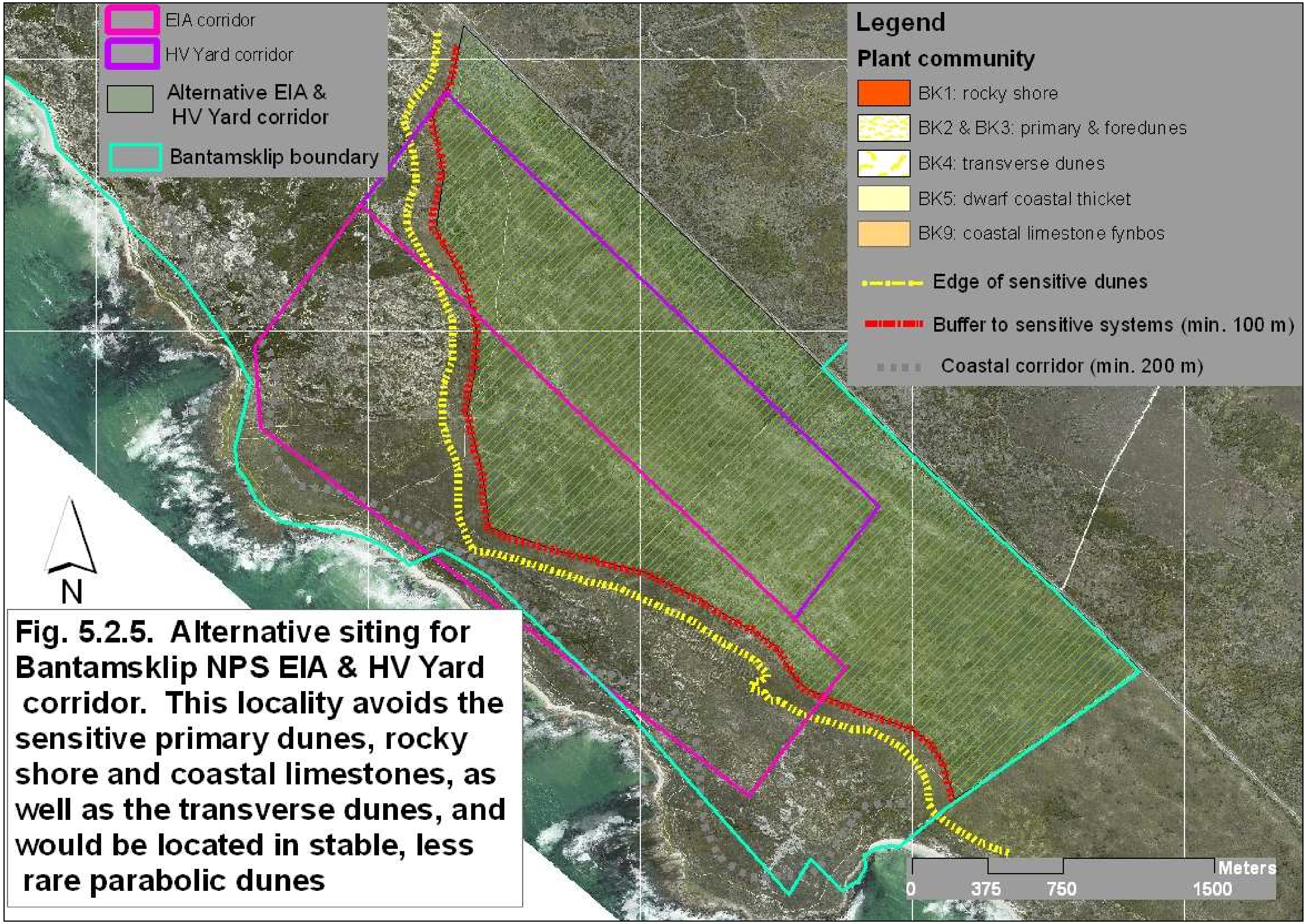


Fig. 5.2.5. Alternative siting for Bantamsklip NPS EIA & HV Yard corridor. This locality avoids the sensitive primary dunes, rocky shore and coastal limestones, as well as the transverse dunes, and would be located in stable, less rare parabolic dunes

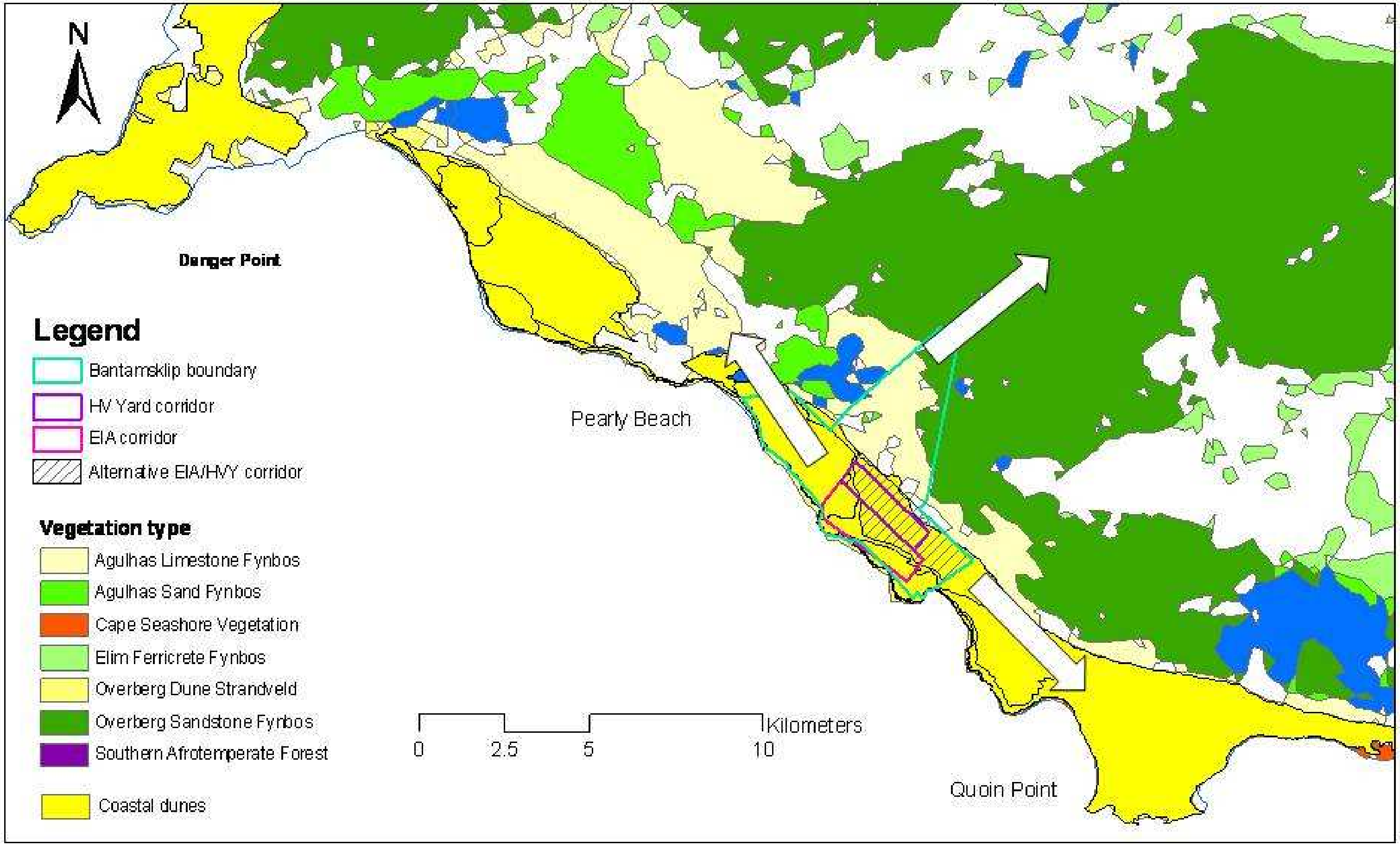


Figure 5.2.6. Linkages between Bantamskliip and the adjacent coastline and inland areas. Location of a NPS facility within the present EIA corridor will have a major negative impact on the coastal corridor if a 200 m width is not provided

5.2.7 Monitoring

(i) Rehabilitation

Goal: to ensure that rehabilitation with indigenous species is carried out effectively and has long-term sustainability

a. Uninvaded areas

Where habitats have been unnaturally disturbed but are not invaded by *Acacia cyclops* rooikrans or *Acacia saligna* Port Jackson willow, rehabilitation with indigenous species is to be implemented. Such rehabilitation should follow a plan put together by a rehabilitation specialist, and using locally occurring indigenous species. Details of the plan are presented in section v above. Rehabilitant success must be monitored on a three monthly basis for the first year, and then six monthly until acceptable species densities and cover are achieved.

b. Invaded areas

Areas invaded by rooikrans or Port Jackson willow should be cleared and rehabilitated. The latter should only be implemented if fynbos and thicket species do not return to a desired cover and species complement. The latter two factors should be monitored and targets set for both these two criteria; this should be included in the rehabilitation plan.
Whilst it is strongly recommended that woody aliens be cleared manually – for both social as well as ecological reasons – individuals removing acacias should be subject to a code of conduct which would govern behaviour on site. Key issues include damage to plants and animals, toilets, fire, and general behaviour to be consistent with that of a nature reserve. Activities of these individuals need to be monitored by the on-site supervisor or conservation manager.

(ii) Coastal corridor

Goal: to ensure a coastal corridor is created in an appropriate manner and is maintained in the long-term

Implementation of a coastal corridor (see section (vii) above) must be a key goal of the development of the nuclear facility. Monitoring must be implemented to ensure that the coastal corridor is maintained in as natural a state as possible. This would include monitoring the rehabilitation of areas which have been excavated for the inlet and outlet pipes and the area immediately alongside the nuclear structure. Rehabilitation with indigenous species should be undertaken following the plan discussed above.

Institution of a functional coastal corridor is closely allied with the re-siting of the EIA corridor (Figure 5.2.5).

(iii) Relocation and/or growing on of Red Data species

Goal: to ensure that all RD species affected by development are relocated or successfully grown on in a nursery and retained to the wild

Relocation and/or growing on of Red Data species should be included in the site's rehabilitation plan. Key performance criteria would include the reintroduction of RD species into protected areas, either on the site or in nearby nature reserves, or the growing on of such species for introduction into the area through the rehabilitation plan. The bottom line is to ensure there would not be a reduction in the natural densities and populations in each RD species.

(iv) State of conservation area

Goal: to ensure that the natural areas of Bantamsklip are maintained in a state consistent with that of a well-managed nature reserve

A conservation area, guaranteed perpetuity regardless of ownership, should be created. A conservation manager should be appointed who would ensure that a management plan is drawn up for the area and implemented. Key performance areas would be: alien eradication, rehabilitation, creation of a trail system for the public, control of access and use of the area, control of vehicles entering the area.

5.3 Thyspunt

5.3.1 Negative impacts

Only impacts associated with the construction of one NPS and one HV Yard are considered here, and not the whole EIA corridor. The impact assessment maps nevertheless provide a good basis from which to prioritise the least sensitive and rare areas for such construction to occur.

a Loss of habitat and species

(i) EIA corridor

Extent of the proposed EIA corridor is some 445 ha.

Vegetation type

The proposed EIA corridor comprises the Least Threatened vegetation type (i.e. **low** rarity***)***, Algoa Dune Strandveld (Community T4 – Figure 4.3.5), with a smaller area of Southern Cape Dune Fynbos (also Least Threatened) (Rouget *et al*., 2004) or Community T7 - Figure 4.3.5) (Figure 5.3.1a and also Appendix 4.3.5). A small part of the Langefontein would also be impacted were the eastern extremity of the EIA corridor to be developed (Figures 4.3.5 and 5.3.1a, and Appendix 4.3.5). Loss of dune fynbos and thicket would be local, of low significance and permanent. However any losses of wetland would be highly significant and permanent, with major implications at local, regional and national level. Although the Langefontein wetland system is part of the Cape Lowland Freshwater Wetlands (and for Thyspunt omitted from the SANBI vegetation map – see Mucina and Rutherford, 2006) - and is Vulnerable (Rouget *et al*., 2004) under no circumstances is it to be impacted by the NPS and this has been dealt with in the sections below.

Habitat

With the exception of the Langefontein wetlands (**very high** rarity), the corridor is located mainly in habitat of **very low** and **low** rarity (Figure 5.3.1b and also Appendix 4.3.5). Overall sensitivity is **medium**, mainly due to erosion potential and proneness to fire (Appendices 4.3.5 & 4.3.6). Such loss would be permanent but localised.

Species rarity (unweighted)

All phases are located in habitat which either has no Red Data species or has **low** rarity (Figure 5.3.1c and also Figure 4.3.13). Red Data species losses would be localised and permanent.

Weighted species rarity

A similar situation exists for weighted Red Data species, where species rarity is either lacking or is very low to low (Figure 5.3.1d and also Appendix 4.3.5). Red Data species losses as above.

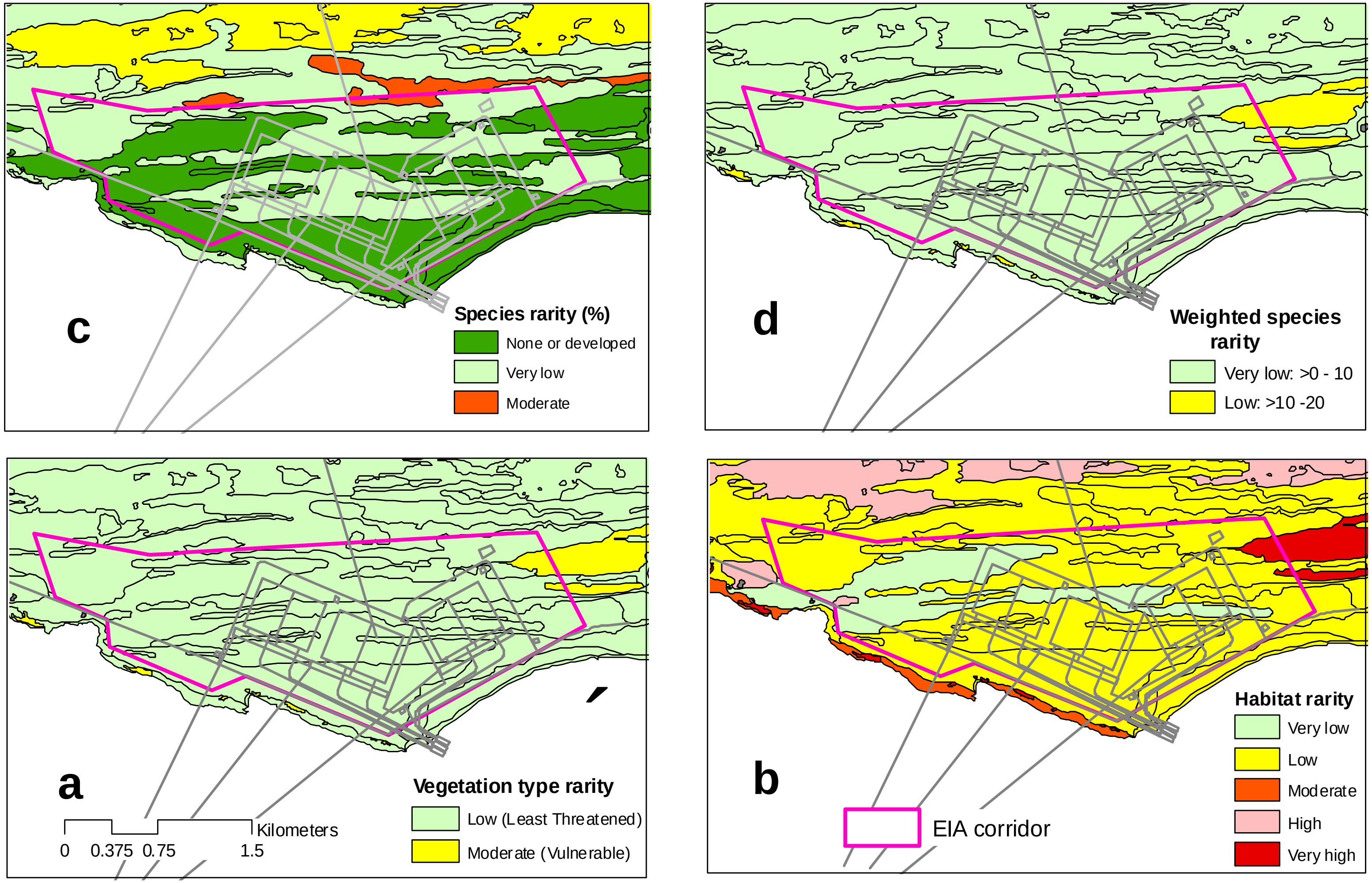


Figure 5.3.1. Impacts associated with proposed footprints for a nuclear power station at Thyspunt. a: vegetation type rarity; b: habitat rarity; c: % species rarity (unweighted); d: weighted species rarity

The following species are potentially affected (see Table 4.3.6): *Agathosma stenopetala* (Vulnerable - VU), *Erica glumiflora* (VU), *Othonna rufibarbis* (Near Threatened - NT), *Pelargonium suburbanum* subsp. *suburbanum* (VU), *Psoralea repens* duine-ertjie (NT), *Rapanea gilliana* dwergboekenhout (Endangered - EN), *Satyrium princeps* (VU) and the sedge *Tetraria brachyphylla* (NT).

(ii) Powerlines

Vegetation type

The proposed powerline alignment would cross stable parabolic and unstable (mobile) transverse dunes between the EIA corridor and the HV Yard, north of the northern transverse dune complex. These comprise Algoa Dune Strandveld (Community T3) and Southern Cape Dune Fynbos (Community T7) (Mucina & Rutherford, 2006), both of which are Least Threatened (i.e. **low** rarity) (Figure 5.3.2a and also Appendix 4.3.5). Such loss would be local, of low significance and permanent.

Habitat

The footprint would be located in habitat of **low** or **high** rarity (Figure 5.3.2b and also Appendix 4.3.5), with highest rarity the transverse dunes. Overall sensitivity is moderate, except for the transverse dunes, where sensitivity rises to high, chiefly courtesy of erosion potential, localised proneness to fire and low resilience (Appendices 4.3.5 & 4.3.6). Any losses, for example to the pylon footprints, would be permanent, of low significance but localised. In addition, losses would be compounded if a service road is built under the powerlines.

Species rarity (unweighted)

The NPS would be located in habitat which mostly has no, very low or low species rarity. A small area within the EIA corridor has moderate rarity (Figure 5.3.2c and Appendix 4.3.5). Impact on Red Data species will be minimal due to general lack of rarity and small size of pylon footprints. Losses, if incurred, would be localised and permanent.

Weighted species rarity

The weighted Red Data species rarity is very low (Figure 5.3.2d and Appendix 4.3.5) across the length of the possible alignment. Red Data species losses will thus be negligible, but localised and permanent.

The following species would be potentially affected (see Table 4.3.6): *Agathosma stenopetala* (Vulnerable - VU), *Erica glumiflora* (VU), *Merxmuellera cincta* subsp. *sericea* olifantsgras (VU), *Othonna rufibarbis* (Near Threatened - NT), *Pelargonium suburbanum* subsp. *suburbanum* VU), *Psoralea repens* duine-ertjie (NT), *Rapanea gilliana* dwergboekenhout (Endangered – EN), the orchid *Satyrium princeps* (VU) and the sedge *Tetraria brachyphylla* (NT).

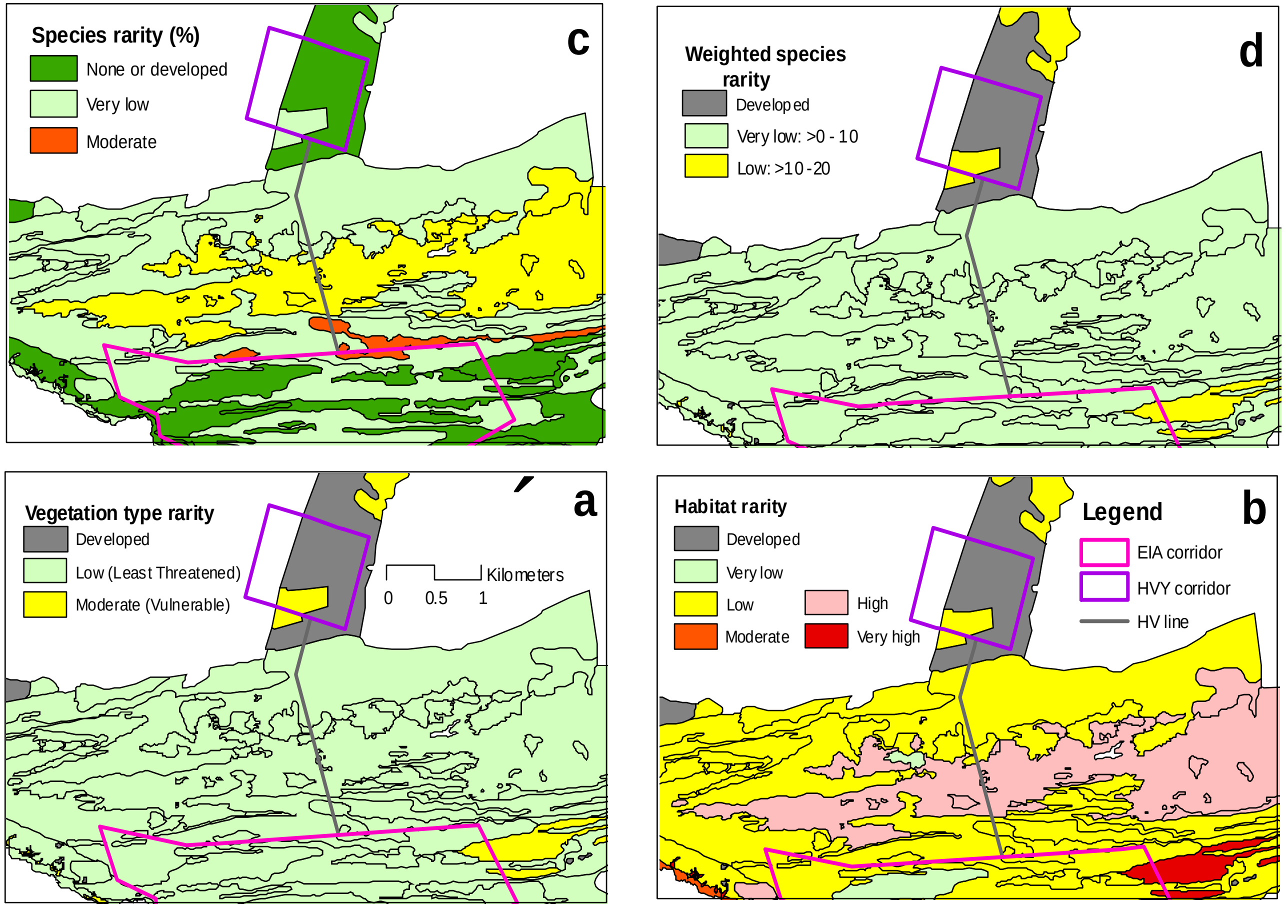


Figure 5.3.2. Impacts associated with planned powerlnes leading from a proposed nuclear power station at Thyspunt. a: vegetation type rarity; b: habitat rarity; c: % species rarity (unweighted); d: weighted species rarity

(iii) HV yard

The extent of the HV Yard is approximately 102 ha.

Vegetation type

Part of the Yard would impact on Tsitsikamma Sandstone Fynbos, which has medium conservation value (Vulnerable – Rouget *et al*., 2004) (Figure 5.3.3a and also Appendix 4.3.5). Loss of this vegetation type would however be minimal, given the small size of the Yard, but would be localised and permanent. Note, too, that most of the sandstone fynbos in the north of the site (i.e. the panhandle) is severely degraded due to regular burning and heavy grazing.

Habitat

Part of the Yard would lead to the loss of habitat with **low** rarity (sandstone fynbos) (Figure 5.3.3b and also Appendix 4.3.5). Loss would be permanent and localised.

Red Data species (unweighted rarity)

The sandstone vegetation has a **very low** species rarity (Figure 5.3.3c and also Appendix 4.3.5), with only one species potentially affected and ranked as the lowest rarity (NT – Table 4.3.6). The footprint of the HV yard is also small, suggesting that the chance of encountering such a species would be reduced (see Figure 5.3.3c).

Red Data species (weighted rarity)

Weighed species rarity is no different from unweighted species rarity, so losses would be localised and low (Figure 5.3.3d and also Appendix 4.3.5). The only species potentially affected (Table 4.3.6) would be the vygie, *Alepidea delicatula* (Rare - R).

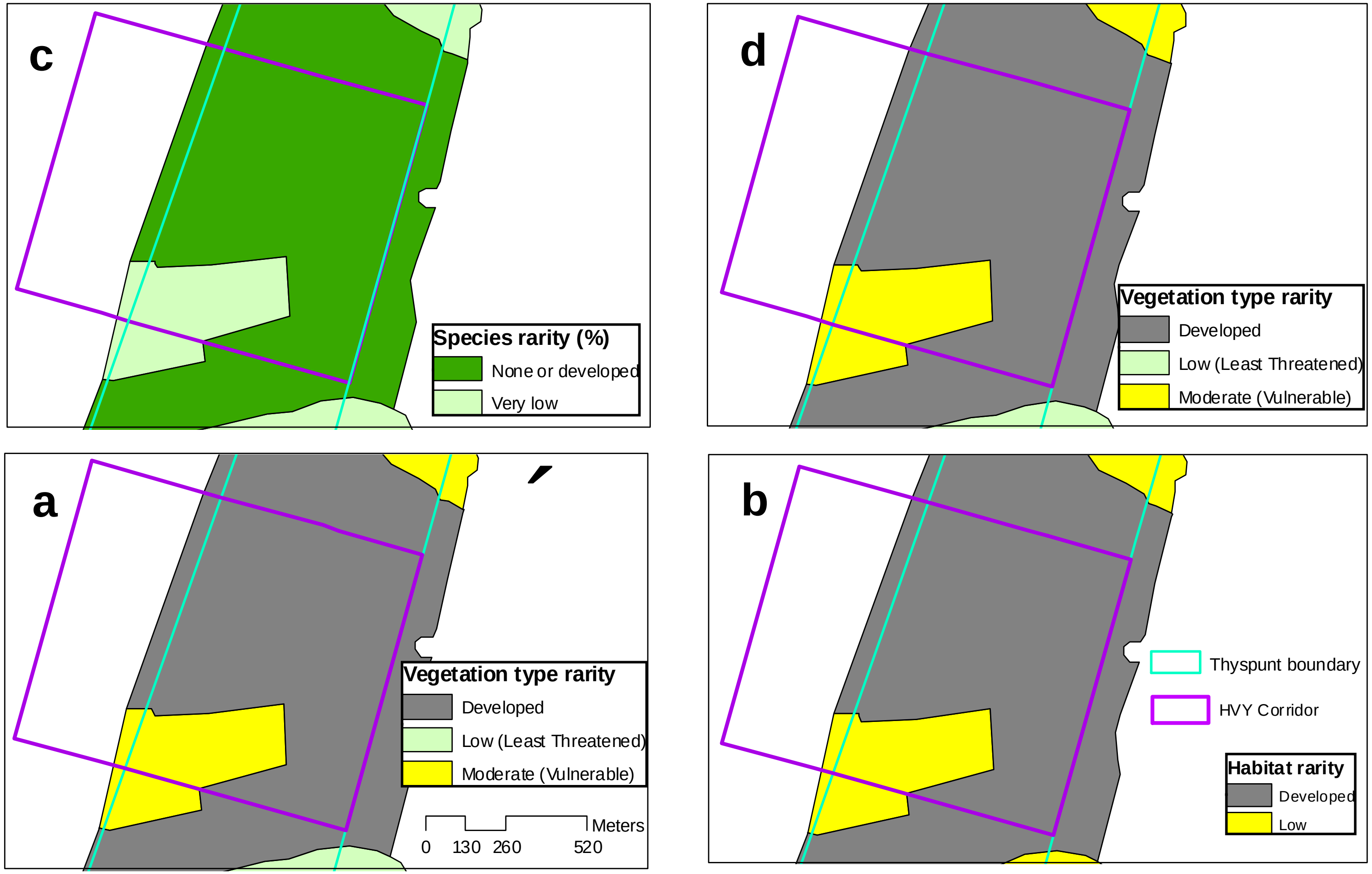


Figure 5.3.3. Impacts associated with proposed footprints for a HV Yard linked with a nuclear power station at Thyspunt. a: vegetation type rarity; b: habitat rarity; c: % species rarity (unweighted); d: weighted species rarity

(iv) Eastern Access Road

An Eastern Access Road, which would have its origin in Cape St. Francis and continue in a westerly and south-westerly direction towards the proposed power station (Figure 5.3.4), is planned, The road was realigned following a site visit on 12 and 13 July 2008, and should now avoid both the sensitive mobile northern and southern transverse dune systems. It would also cross the wetlands east of the Langefontein but also run along the southern boundary of the latter system; the Fresh Water Consulting Group, in their wetlands specialist report for the NPS EIA, has provided detail for this section. Most of the route would cross vegetation of low rarity (i.e. Southern Cape Dyne fynbos – Rouget *et al*., 2004), although a mosaic of fynbos and thicket, and even forest, would be encountered on stable deflated parabolic dunes. By inference (species sampling was not undertaken along the road alignment, but similar habitats were assessed within the Thyspunt boundary), species rarity should also be low and Red Data species losses as a consequence would likely be low to minimal.

Red Data species likely to be encountered in the area are *Agathosma stenopetala* (Vulnerable - VU), *Erica glumiflora* (VU), *Othonna rufibarbis* (Near Threatened - NT), *Pelargonium suburbanum* subsp. *suburbanum* (VU), *Rapanea gilliana* dwergboekenhout (Endangered - EN), *Satyrium princeps* rooitrewwa (VU) and the sedge *Tetraria brachyphylla* (NT) (see Table 4.3.6).

(v) Western Access Road

The planned Western Access Road, running between the eastern boundary of Oyster Bay and along the coast to the nuclear facility, would have a high impact on the northern transverse dunes and would cause mobilisation of parabolic dunes in this area (Figure 5.3.5). Any physical structure crossing these dunes would have a deleterious effect as movement of sand would be impaired. The routing would also lead to fragmentation of the western dunes, thereby reducing habitat viability in this part. Having said that, the planned road could also possibly cross one or more dune slack (valley) coastal wetlands (see Figure 4.3.5) and this aspect has been dealt with by the Fresh Water Consulting Group in their wetlands specialist report for the EIA. However, the terrestrial vegetation types affected are all Least Threatened and the alignment could be designed to pass through habitats of low rarity, in particular avoiding any tall thicket and coastal forest which occurs here in patches.

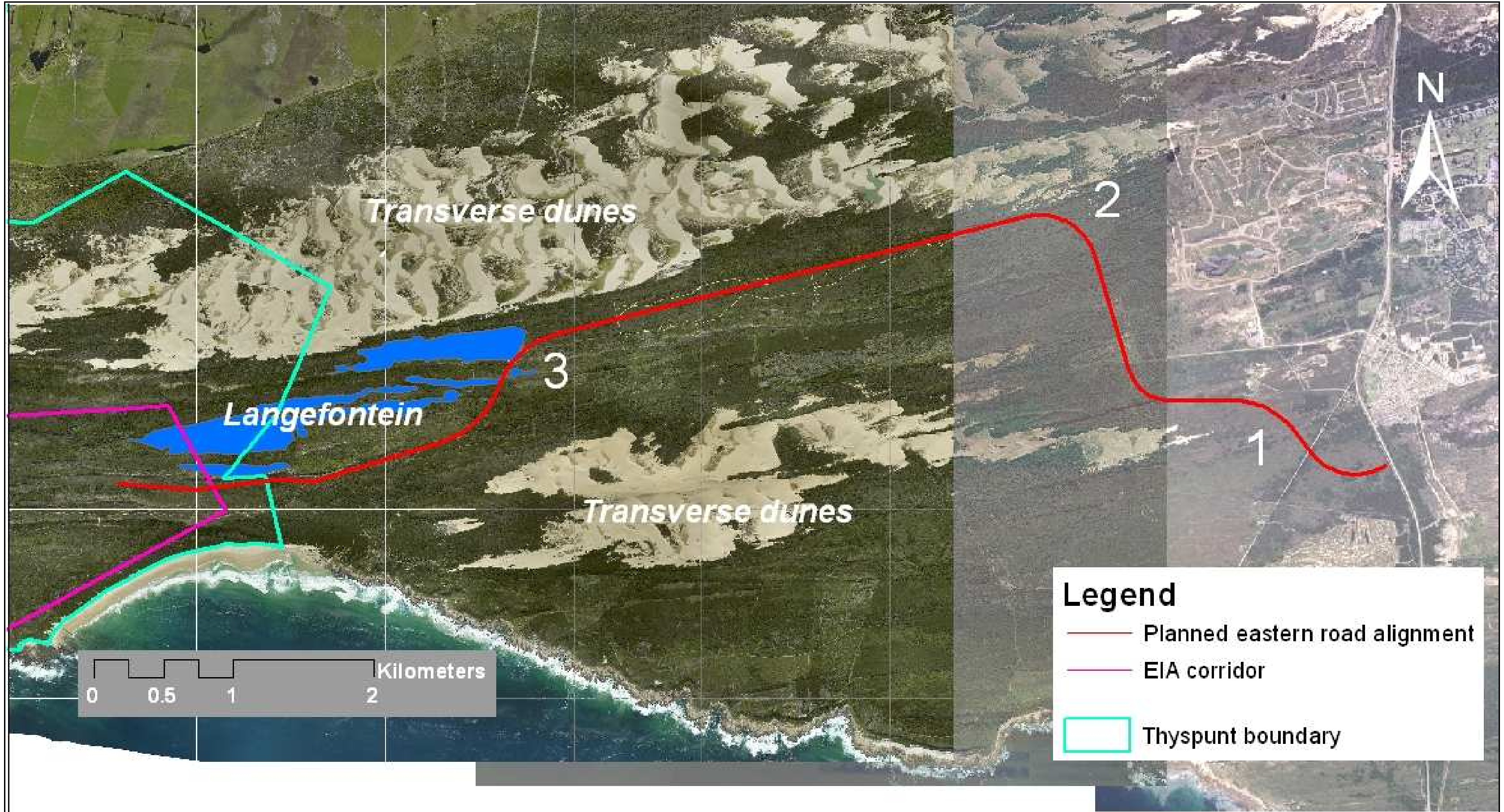


Figure 5.3.4. Planned eastern access road to the proposed nuclear power station at Thyspunt. Note that this alignment, amended after a site visit in mid July (2008), avoids the southern (1), but just skirts (2) the northern transverse dune system. Great care will need to be taken in crossing the wetlands to the east of the Langefontein (3)

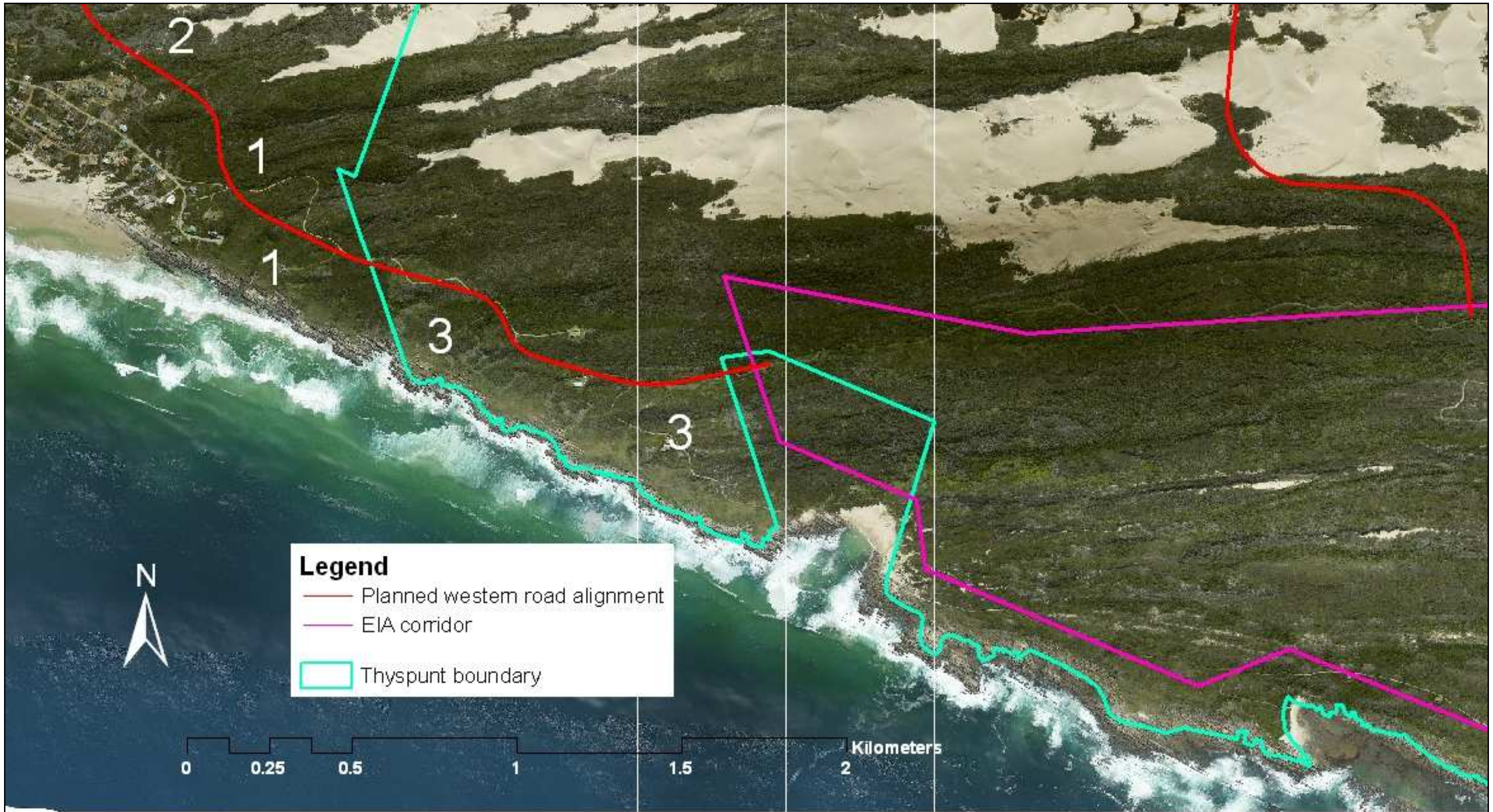


Figure 5.3.5. Planned western access road to the proposed nuclear power station at Thyspunt. Note that the alignment would impact the western end of the northern transverse dune (1) and mobilising parabolic dunes (2). The route would in addition lie within the sensitive coastal zone (3), where rare limestone outcrops are also located (see Community T8 in Figure 4.3.5)

Species rarity – both unweighted and weighted – is also very low to low. However, the dilemma with this alignment is in how the endemic Oyster Bay Cape St. Francis headland bypass dune is viewed. This is discussed to some degree under positive impacts below, but requires a regional outlook on just how important this system is. Fragmentation and reduction in ecosystem functioning make this an unwise alignment, particularly as development and subsequent stabilisation of this system in the east has led to build up of dune height, with the tar road to Cape St. Francis acting as a partial barrier to sand movement). If the road is to be built, then the existing routing should be followed where possible, with implementation of and the strong mitigation measures.

Red Data species likely to be encountered along this alignment are similar to those for the Eastern Access Road.

(vi) Northern Access Road

Following public participation and an integration workshop amongst the various specialists held in November 2009, the option to construct a south-north road across the sensitive transverse and parabolic dunes lying between the EIA corridor and the HV Yard has been abandoned.

(vii) Spoil sites

It is estimated that some ***6.372*** million m^3 of sand and ***0.708*** million m^3 of bedrock will need to be removed for construction of the NPS (figures supplied by Eskom). Excavation for a NPS causes a number of major impacts:

a) stockpiling of spoil elsewhere on the site or preferably off site

b) dealing with such spoil, as only ***1.518*** million m^3 will be used as backfill and possible landscaping on site, and linked with excavation activity is the operation of plant as well as transport of material away from the site.

All of the above would cause potential impacts through loss of natural vegetation and Red Data species (locally) to excavation and road construction, damage to vegetation and have major implications for rehabilitation. Indirect impacts would result from dust in both the excavation as well as transport process.

However, assuming previously disturbed sites are used, then impacts on vegetation type, habitat and Red Data species would be low (see under Rehabilitation, below).

b Loss of ecosystem function

(viii) Nuclear power station

Construction of the power station in its proposed present locality would lead to the loss of fairly extensive tracts of partially stable parabolic and stable deflated parabolic dunes. These dunes are well-represented on the Thyspunt site as well as elsewhere along the Eastern Cape coastline (see Figure 4.3.11). In addition, there are indications, based upon historical aerial photographs, that the area has been increasingly stabilised in recent times, with a general reduction in extent of mobile sand (Gert Greeff, pers.comm.). However, development in the eastern part of the EIA corridor could well impact on the sensitive mobile and semi-mobile embryo dunes along the Thysbaai coastline (Figure 5.3.6 and see Figure 4.3.11).

Loss of ecosystem function within the Dune Fynbos and Dwarf Thicket on parabolic and deflated parabolic dunes is probably low as large, connected tracts of this system would still remain intact post-construction. The greatest concern would be the potential loss of wetland function for both the Langefontein wetland (just to the north-east of the proposed EIA Corridor) and the coastal wetlands (to the south of the site). This aspect has been dealt with in detail by the Fresh Water Consulting Group. The geohydrological monitoring bore holes on the site indicate that draw down of ground water will not impact on the Langefontein wetland, as long as effective impermeable barriers are installed on all sides of the NPS excavation area. It is however, acknowledged, that there might well be limited degradation of coastal seep wetlands. The precautionary principle must therefore be adopted here, as these two systems are extremely rare and endemic (see above) and are essentially irreplaceable.

(ix) Powerlines

Construction of powerlines along the proposed alignment would have a negligible effect on dune ecosystem functioning, as long as pylons avoid the mobile part of the transverse dunes. Any structure built in the mobile dunes will have a deleterious effect on functioning, leading to change in quality of sand supply and possibly direction, ***where the wind could arguably swirl around the pylon bases.*** Such effect would be compounded through the building of a service road under the powerlines.

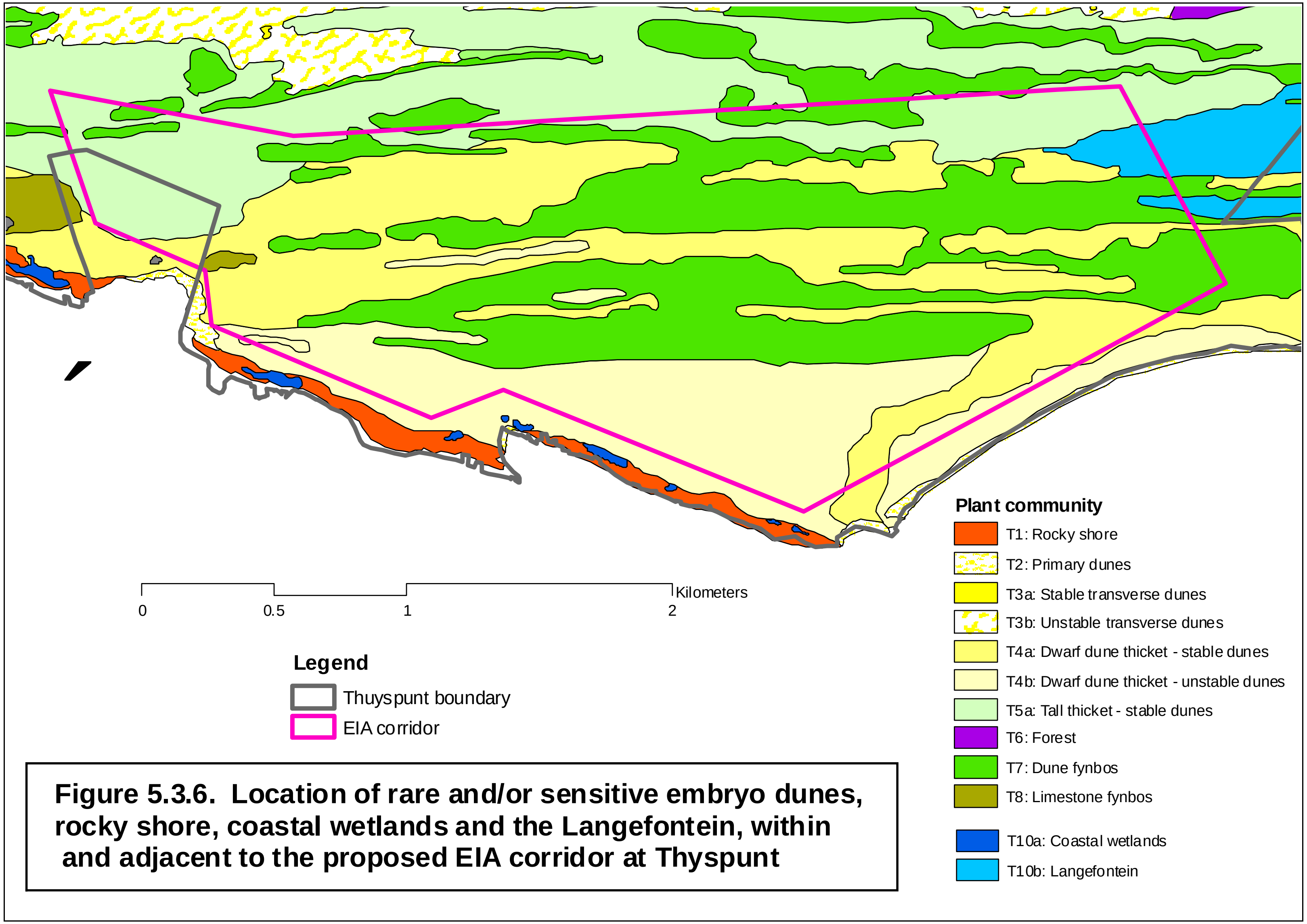


Figure 5.3.6. Location of rare and/or sensitive embryo dunes, rocky shore, coastal wetlands and the Langefontein, within and adjacent to the proposed EIA corridor at Thyspunt

(x) HV Yard

Losses here would be minimal as the sandstone vegetation is in poor condition and is unconnected (Figure 4.3.5). Habitats which are not connected to mainland vegetation tend to lose vigour and ecosystem function (Diamond, 1975).

(xi) Eastern Access Road

Losses of ecosystem function would likely be minimal provided the mitigatory measures recommended below, in particular avoidance of the mobile transverse dunes, are implemented.

(xii) Western Access Road

Losses here are likely to be extensive as sand movement would be negatively impacted and the functioning of the dune system downwind (to the east) affected. The interaction between dune sand and wetlands is also a factor and this has been discussed by the Fresh Water Consulting Group in their wetland specialist report.

5.3.2 Climate change

Prestedge *et al.* (2009) have determined a 1:100 year sea level floodline for Thyspunt, using a number of factors including the tide, storm surge and erosion, wave action and climate change, with wave run-up being the considered the dominant process (Figure 5.3.7). The Prestedge *et al*. (2009) report makes note of the fact that the coastline is sandy and that beach erosion is likely to be high, both along the coast as well as if the coastline is breached. In the latter scenario, flooding could occur behind the dunes immediately on the coast, especially at Thysbaai itself (Figure 5.3.7).

Primary and deflated parabolic dunes would be the most affected, with likely impacts on the functioning of the latter (Figures 5.3. and 5.3.8). However the rocky shore would also suffer impacts from the predicted sea level rise.

The maximum predicted water surface elevation above mean sea level (amsl), taking climate change into account, is 7.4 m, 1.3 m above the present maximum. 1:100 year levels are shown in Figure 5.3.7.

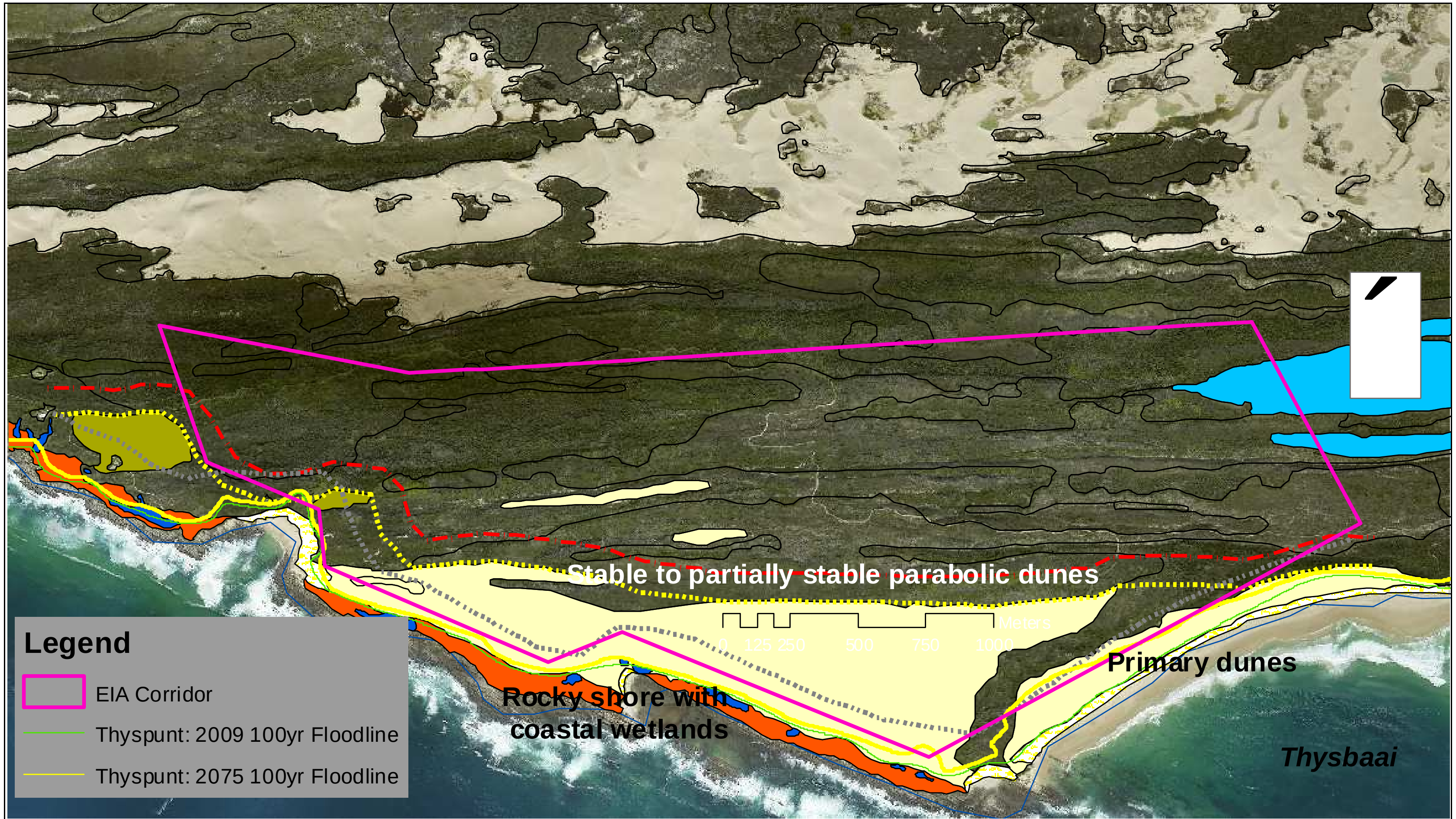


Figure 5.3.7. Predicted rise in sea level for the Thyspunt coastline showing comparison with current level. The primary dunes and coastal wetlands would be the most susceptible to erosion, but rise in sea level would also impact the rocky shore habitat. Note marked erosion along the Thysbaai coastline

5.3.3 Cumulative impacts

Impacts likely to be incurred in the long term and over the operational phase of the facility will include those which fragment and in any way compromise ecosystem functioning. Key areas of concern are the coastal wetlands and the Langefontein wetland, which could be severely compromised in the long term if appropriate mitigatory measures are not introduced. The Western Access Road would permanently compromise the western end of the northern transverse dune, whilst construction powerlines across the middle of the same transverse dunes could also create long term, if low, impacts if mitigation is inadequate. Construction of further NPS phases could also cause further permanent losses of wetland habitat and functioning.

5.3.4 Positive impacts

The Oyster Bay-Cape St. Francis headland bypass dune (HBD) and its associated wetlands is seen as a key priority for conservation (Tinley, 1985; Cowling *et al*., 2002, and also La Cock & Burkinshaw, 1996). However, this system is under-conserved with only two reserves in the intact part of the HBD (Figure 5.3.7). Neither of these - Eskom’s Thyspunt Natural Heritage Site and the Rebelrus Private Nature Reserve - has any statutory status. The HBD is being threatened by urban and related development such as the St. Francis Golf Course and Links, particularly from the east (Figure 5.3.8). Already some 2 944 ha of an estimated 15 469 ha of dunefields (i.e. 19.0% or nearly a fifth of the HBD) between Oyster Bay and Cape St. Francis (areas from mapped GIS assessment – see Table 5.3.1) has been developed, mainly through residential expansion or golf courses. Just recently, one of the farms between Cape St. Francis and Thyspunt has been granted limited development rights, and it is these developments which are fragmenting the HBD and which will eventually destroy its functioning in totality. Clearly the Eastern Cape EIA process has failed to recognise the importance of the HBD and is inadvertently permitting the gradual whittling away of this magnificent dune and wetland complex.

If a nuclear facility were to be built at Thyspunt it would bring some 1 400 ha of four major dune types to a conservation area for the HBD against a relatively small area of 200 – 280 ha for a NPS (see Table 5.3.2). If Eskom follows the example of Duynefontein (Koeberg Private Nature Reserve), a similar reserve could be created here. However, as stated above, this form of conservation area has no permanent tenure. If a nuclear facility is built at Thyspunt, then a nature reserve would need to be created which provides permanency to such a conservation endeavour. This reserve would therefore need to be effective for both the lifespan of the power station as well as for the decommissioning phase and beyond.

Although biodiversity offsets have not been accepted as part of national policy there is a possibility they might be still implemented in some form or another (Ms Susie Brownlie, pers.comm.). The Western Cape Provincial guidelines for biodiversity offsets (Brownlie, 2007) suggest such offsets should be applied for net loss of quality habitat on site and that a developer would need to acquire additional good quality habitat as an offset to that lost on his/her particular site. However, the guidelines do provide for “on site off sets” whereby the loss of habitat can be made good on the same site. This would apply in the case of Thyspunt, given the extent of natural vegetation which would not face development.

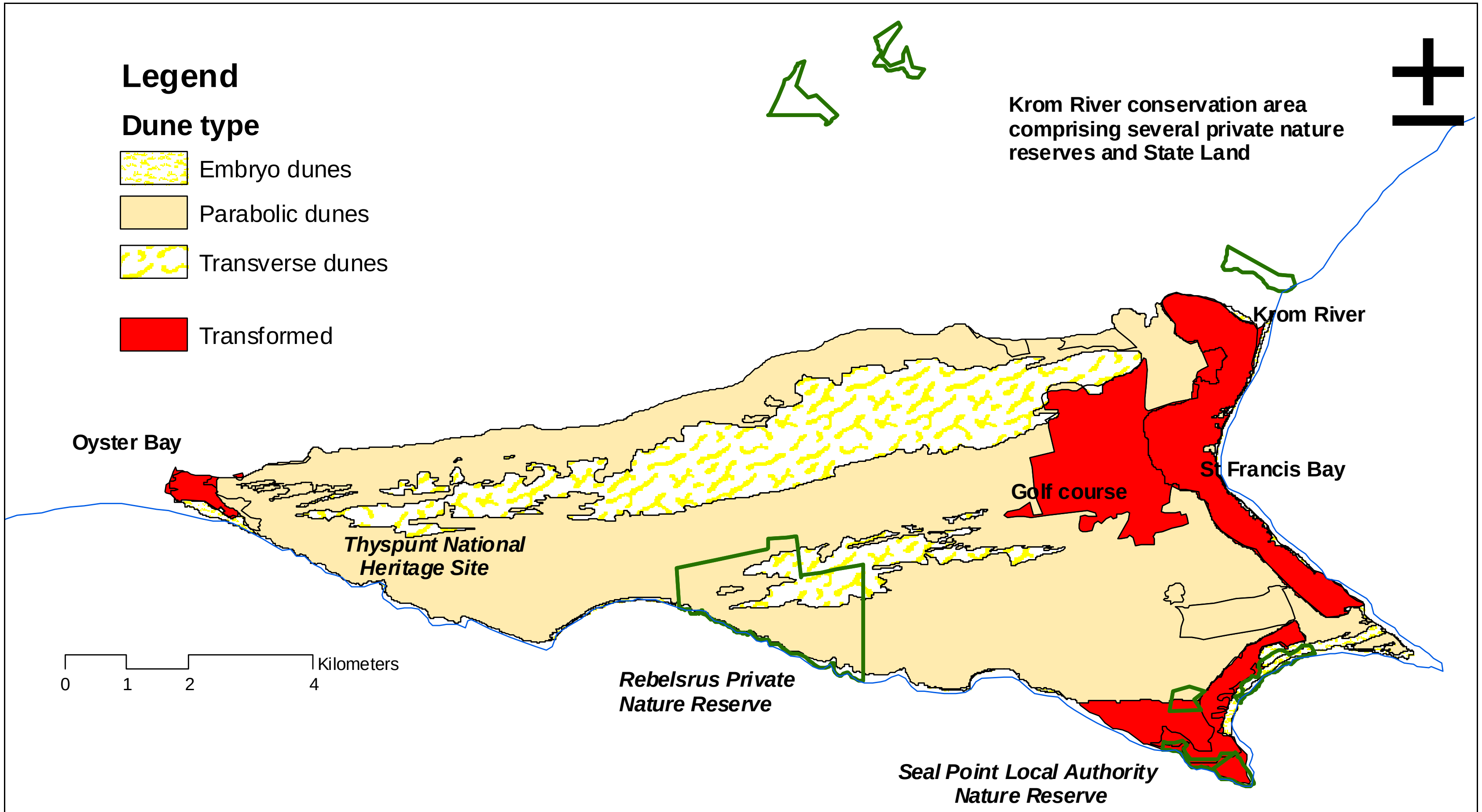


Figure 5.3.8. The Oyster Bay-Cape St Francis headland bypass dune (HBD) showing conservation areas in green. The only statutory reserve in the area is the Local Authority Nature Reserve at Cape St Francis, which does not contribute towards the conservation of the HBD. The two reserves which do - Thyspunt National Heritage Site and Rebelsrus Private Nature Reserve - both have no guaranteed long-term tenure

Table 5.3.1. Degree of transformation on the Oyster Bay-Cape St. Francis headland bypass dune	
	Hectares
Untransformed	12 525
Transformed	2 944
Total	**15 469**

Table 5.3.2. Extent of dune systems within the Thyspunt boundary	
Dune type	**Area (ha)**
Embryo dunes	1.5
Parabolic dunes	183.4
Deflated parabolic dunes	913.2
Transverse dunes	312.6
Total	**1 410.7**

5.3.5 Assessment of impacts

Assessment of negative impacts, with and without mitigation, is presented in Table 5.3.3 (nuclear facility and spoil site), Table 5.3.4 (powerlines and HV Yard), Table 5.3.5 (Eastern Access Road) and Table 5.3.6 (Western Access Road).

Significant impacts for the nuclear facility after mitigation are: loss of habitat, and RD species, and for the Western Access Road, loss of habitat, ecosystem function and Red Data species.

Table 5.3.3: Impacts on botanical resources and dune ecology at Thyspunt: NPS and Spoil (revised February 2011)

Impact	Intensity	Extent	Duration	Impact on irreplaceable resources	Consequence	Probability	SIGNIFICANCE
Loss of coastal habitat							
Impact 1: Loss of dune fynbos and thicket	***High***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - move footprint (no mitigation for direct habitat loss, but can avoid good quality and rare sites)	***Low***	***Low***	***Low***	***Low***	***Low***	***Medium***	***Low***
Loss of coastal dunes							
Impact 2: Loss of semi-mobile parabolic dunes, rocky shore, coastal limestones)	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - locate footprint away from these habitats	***Low***	***Low***	***High***	***Low***	***Low***	***Medium***	***Low***
Loss of ecosystem function							
Impact 3: Loss of coastal dune and adjacent wetland function	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - locate footprint away from affected areas	***Medium***	***Low***	***Medium***	***Low***	***Low***	***Medium***	***Medium***
Loss of Red Data species							
Impact 4: Loss of locally occurring Red Data species	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - translocate or grow on affected species	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Climate change							
Impact 5: Loss of coastal habitat/ possible impacts on NPS	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - coastal corridor and NPS setback from coast	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Cumulative impacts							
Impact 6: Loss of species, habitat and ecosystem functioning	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - locate footprint away from wetlands	***Medium***	***Low***	***Medium***	***Medium***	***Medium***	***Low***	***Medium***

Table 5.3.4: Impacts on botanical resources and dune ecology at Thyspunt: Powerlines and Heavy Voltage Yard (revised February 2011)

Impact	Intensity	Extent	Duration	Impact on irreplaceable resources	Consequence	Probability	SIGNIFICANCE
POWERLINES							
Loss of habitat							
Impact 1: Loss of dune habitat	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - align powerlines to avoid rare and sensitive habitat	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Loss of Red Data species							
Impact 2: Loss of locally occurring RD species	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - locate bases of powerlines to avoid RD species; translocate or grow on RD species	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Cumulative impacts							
Impact 3: Loss of species, habitat and ecosystem functioning	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - locate bases of powerlines to avoid crossing sensitive transverse dunes and wetlands	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
HEAVY VOLTAGE YARD							
Loss of habitat							
Impact 1: Loss of low quality sandstone fynbos	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - relocate HV Yard to disturbed habitat	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Loss of ecosystem function							
Impact 2: Loss of sandstone habitat function	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - relocate footprint of HV Yard to disturbed habitat	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Loss of Red Data species							
Impact 3: Loss of locally occurring RD species	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - relocate footprint of Yard to avoid RD species; translocate or grow on RD species	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Cumulative impacts							

Impact 4: Possible loss of species, habitat and ecosystem functioning	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - locate footprint away from good quality sandstone fynbos	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***

Table 5.3.5: Impacts on botanical resources and dune ecology at Thyspunt: Eastern Access Road (revised February 2011)

Impact	Intensity	Extent	Duration	Impact on irreplaceable resources	Consequence	Probability	SIGNIFICANCE
Loss of dunes							
Impact 1: Loss of dune fynbos & thicket	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - no mitigation for habitat loss, but avoid good quality and rare sites	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Loss of wetlands							
Impact 2: Loss of wetlands to east of the Langefontein	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - realign to avoid wetlands; bridge over wetland just east of the Langefontein	***Low***	***Low***	***Low***	***Low***	***Low***	***Medium***	***Low***
Loss of ecosystem function							
Impact 3: Possible loss of wetland function	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - realign away from sensitive wetlands	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Loss of Red Data species							
Impact 4: Loss of locally occurring RD species	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - realign road to avoid RD species, and/or translocate or grow on in nursery	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Cumulative impacts							
Impact 5: Loss of species, habitat and ecosystem functioning	***High***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium-high***
Mitigated - locate road away from mobile dunes and wetlands	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low-medium***

Table 5.3.6: Impacts on botanical resources and dune ecology at Thyspunt: Western Access Road (revised February 2011)

Impact	Intensity	Extent	Duration	Impact on irreplaceable resources	Consequence	Probability	SIGNIFICANCE
Loss of dunes							
Impact 1: Loss of dune fynbos & thicket	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - no mitigation for habitat loss, but avoid good quality and rare sites	***Medium***	***Low***	***High***	***Medium***	***Medium***	***Low***	***Low-Medium***
Loss of wetlands							
Impact 2: Loss of wetlands near Oyster Bay	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - realign to avoid wetlands	***Low***	***Low***	***Low***	***Low***	***Low***	***Medium***	***Low***
Loss of ecosystem function							
Impact 3: Loss of part of western transverse dune system & possibly some wetland function	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - realign away from sensitive dunes & wetlands	***Medium***	***Low***	***High***	***Medium***	***Medium-high***	***Medium***	***Medium-high***
Loss of Red Data species							
Impact 4: Loss of locally occurring RD species	***Medium***	***Low***	***High***	***Medium***	***Medium***	***High***	***Medium***
Mitigated - realign road to avoid RD species, and/or translocate or grow on in nursery	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***	***Low***
Cumulative impacts							
Impact 5: Loss of species, habitat and ecosystem functioning	***High***	***Low***	***High***	***High***	***High***	***High***	***High***
Mitigated - difficult to mitigate totally, but where possible locate road away from mobile dunes and wetlands	***Medium***	***Low***	***High***	***Medium***	***Medium***	***Medium***	***Medium***

5.3.6 Mitigation of impacts

(i) Size and location of NPS footprint

The present position of the current EIA corridor provides some leeway for locating the proposed NPS. For Thyspunt, the sensitive coastal environment should be avoided (see Figure 5.3.9 below) and this includes any dunes which are mobile or semi-mobile. In particular both the coastal wetlands as well as the Langefontein wetland should be avoided and a suitable buffer of minimum 200 m wide created. However, the final buffer width should be confirmed by the Fresh Water Consulting Group (wetland specialist for the EIA) who will establish what mechanisms should be set in place to ensure the functioning of both wetland suites is not compromised. Sensitive coastal dune systems should be buffered by a minimum of 100 m.

(ii) Habitat fragmentation

Where rare habitat, such as the coastal wetlands, stands to be lost or compromised, for example by draw down of groundwater, every effort should be made to adjust development footprints so that such habitat is avoided or loss is minimised. Habitats should not be fragmented as this leads to reduced viability, mainly due to decrease in size, and where shape becomes linear as opposed to round (*sensu* Diamond, 1975). Habitat connectivity should also be maintained, so as to optimise ecosystem function.

(iii) Eastern Access Road

Correct alignment of this road is critical to avoiding sensitive and rare habitats, and possibly Red Data species. Already there has been some mitigation through a site visit in mid July 2008. This resulted in significant changes to the alignment, in particular avoidance of the mobile transverse/parabolic dunes at the eastern end of the southern transverse dune system (see Figure 5.3.4) and major changes to the alignment where it crosses the wetlands east of the Langefontein (see the Fresh Water Consulting Group's specialist assessment on wetlands for more detail). In addition, the road would need to avoid the high parabolic ridges which run parallel to the alignment – these can be seen in Figure 5.3.4. Crossing of parabolics should also be undertaken where there are naturally deflated sections or where there has been excavation in the past – an example of this is to the east of the shack belonging to Mr "Dup" Papenfuss, which lies just outside the eastern boundary of the Thyspunt site.

(iv) Western Access Road

The construction of a road over the western section of the northern transverse dune (see Figure 5.3.5) would cause loss of habitat, fragmentation of the dune system and possible loss of dune mobility and function, and general compromise of the endemic headland bypass system between Oyster Bay and Cape St. Francis. This alignment is therefore viewed with extreme caution; the key mitigation would be to follow the alignment of the existing dirt track as closely as possible and to avoid the sensitive habitats discussed above.

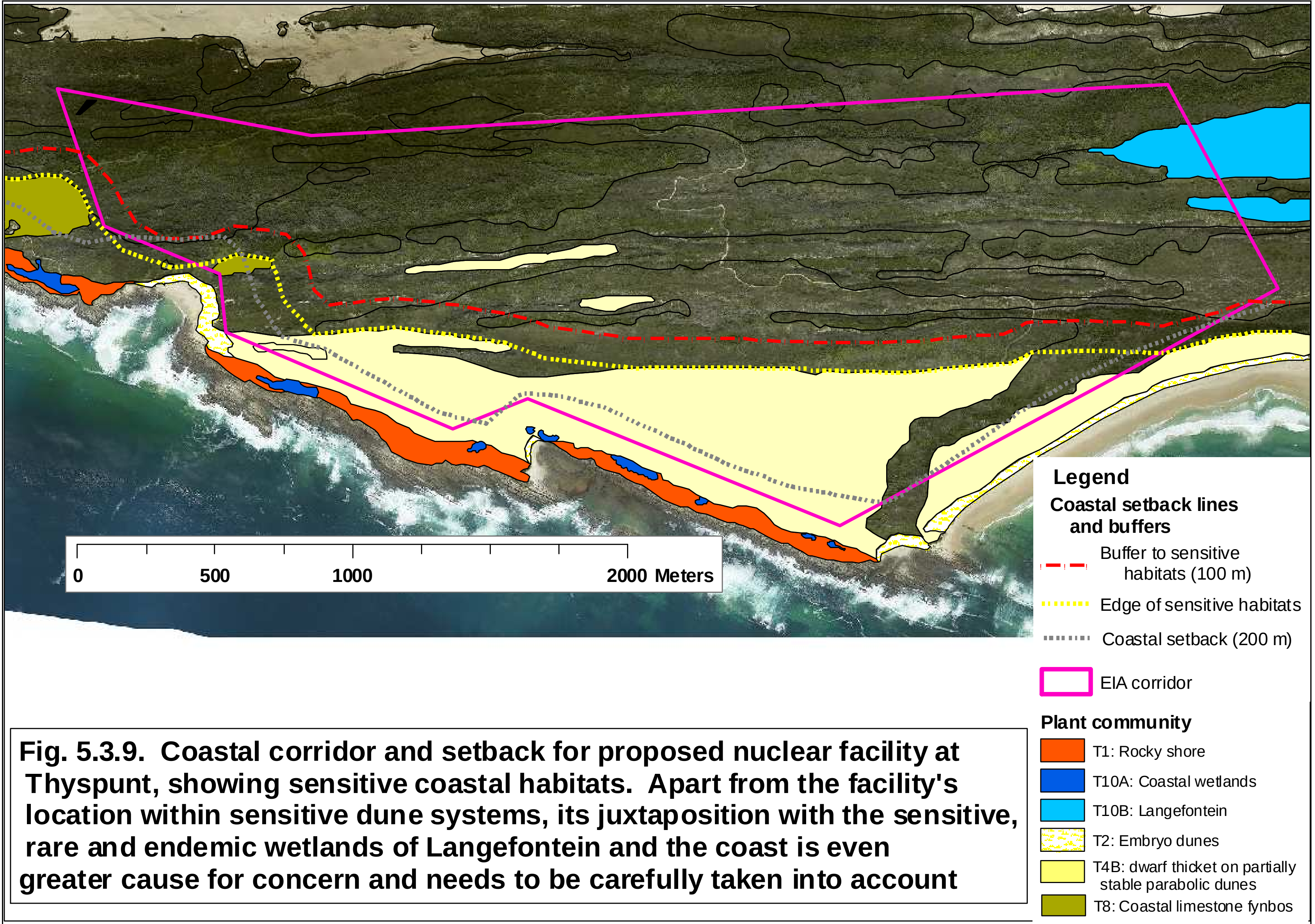


Fig. 5.3.9. Coastal corridor and setback for proposed nuclear facility at Thyspunt, showing sensitive coastal habitats. Apart from the facility's location within sensitive dune systems, its juxtaposition with the sensitive, rare and endemic wetlands of Langefontein and the coast is even greater cause for concern and needs to be carefully taken into account

(v) Powerlines

Where possible, planned powerlines and their associated service roads should be routed away from rare and sensitive systems, in particular wetlands and the transverse dunes. Correspondingly, powerlines can serve as useful ecological corridors and conduits for pollinators and fruit-translocating fauna if the containing habitat is kept in acceptable condition and is ecologically functional.

The south-north crossing of the transverse dunes by powerlines, between the EIA corridor and the HV Yard, needs careful consideration. Presently there is insufficient information on the long-term mobility of the dunes. At least a model of dune mobility needs to be developed which would indicate whether the width of the mobile systems is likely to increase or decrease. Examination of a sequence of aerial photographs from as far back as the 1940's seems to indicate shrinking mobility (Gert Greeff, pers.comm.) but this needs to be tested, based upon current dune behaviour and likely future mobility trends. If transmission lines are to cross the transverse dunes then the individual pylons should be located away from the edge of the mobile zone and given a buffer of no less than 100 m which would accommodate any future growth in dune mobility. Effective buffer width would need to be tested once the mobility model is developed.

There is presently too little detail on the behaviour of the transverse dune system and its annual mobility to recommend any mitigation with confidence. Any permanent structure on these dunes is viewed as an unmitigatible impact for the time-being. The contribution of the Rhodes University research team, led by Prof. Fred Ellery, is of fundamental importance to our understanding of this rare and endemic system.

(vi) Search and rescue

For the construction of a nuclear facility within natural veld, a search and rescue operation is required which would identify all plants which are either extremely rare (i.e. Endangered or Critically Endangered) or which can be used in rehabilitation of the site. This would require the services of a botanical specialist to identify and locate suitable species and to ensure a plan is in place to remove said plants **prior** to excavation's commencing. Plants with a bulb or rootstock have the greatest chance of surviving translocation, whereas most shrubs and many of the graminoids (grasses, sedges, restios), particularly the obligate reseeders, will not translocate successfully.

A selection of species suitable for rehabilitation is shown in Table 5.3.10.

(vii) Rehabilitation plan

Linked with Search and Rescue above (vi) should be a rehabilitation plan which would see that all areas disturbed in the development of the proposed facility are satisfactorily rehabilitated with locally occurring indigenous species. This would include the collection of appropriate plant material prior to construction's commencing, the storage of such material and/or the growing on of suitable material. Plants would need to be at least two to three years old for use in rehabilitation and thus sampling should commence during the construction period, at least three years before commissioning of the plant. An onsite nursery which would accommodate stored and grown on plants would be an absolutely essential requirement for satisfactory rehabilitation. For this purpose a rehabilitation plan needs to be drawn up which would identify suitable species, method of storage and/or propagation, method of planting and maintenance and monitoring of rehabilitation success (see below).

This should be included as a part of the construction and operational EMP.

A comprehensive rehabilitation plan would require the services of a rehabilitation specialist together with a specialist botanist who would identify and locate suitable species; measures should be in place to ensure removal of said plants **prior** to construction's commencing. Plants with a bulb or rootstock have the greatest chance of surviving translocation, whereas most shrubs and many of the graminoids (grasses, sedges, restios), particularly the obligate reseeders, would not translocate successfully.

Seed and/or cuttings should be removed from species which will not translocate easily and grown on in the on-site nursery.

The plan should include the following key elements:

Preparation phase

At least two years before commencement of construction, an on-site nursery with a manager needs to be set up at Thyspunt. A list of appropriate species needs to be drawn up and both seed and cuttings collected, planted out and suitably hardened off. This would provide material ready for planting as areas require to be rehabilitated. In addition certain species could also be translocated into the nursery. The amount of plant material required will be guided by the extent of construction and areas to be disturbed. Both terrestrial and wetland habitats need to be considered.

A list of selected species suitable for rehabilitation is found in Table 5.3.7.

Topsoil

This is perhaps the most critical phase and will determine to a great extent the ultimate success of any rehabilitation work.

- Topsoil (0 – 300 mm depth) should be removed from any area being disturbed temporarily or permanently, and stockpiled. Piles should be no more than 1.5 to 2 m high to increase the chance of aeration, but also to avoid too rapid decomposition of organic matter, the latter essential for providing a good start for new plants

- Stockpiles should be placed in previously disturbed areas and should definitely not be located on natural vegetation. This would lead to the death of the latter.

Planting

Planting of nursery grown and translocated species should be undertaken at a density set by the rehabilitation specialist, but generally at no less than 1 m apart. Time of planning should be just prior to the onset of the rainy season (April to June) so that plants are provided with good moisture conditions prior to the summer season some six months later.

Table 5.3.7. Selected plant species useful for rehabilitation at Thyspunt

Family	Species	Common name	Broad habitat	Form
Dicotyledones				
AIZOACEAE	*Tetragonia decumbens*	kinkelbossie	dunes	groundcover
ANACARDIACEAE	*Rhus crenata*	duinekraaibessie	dunes	Shrub
ANACARDIACEAE	*Rhus lucida*	blinktaaibos	dunes	Shrub
APIACEAE	*Dasispermum suffruticosum*	duineseldery	Primary dunes	Low shrub
APOCYNACEAE	*Carissa bispinosa*	Noem-noem	dunes	
ASTERACEAE	*Arctotheca populifolia*	Sea pumpkin	Primary dunes	Groundcover
ASTERACEAE	Chrysanthemoides monilifera	bietou	dunes	Shrub
ASTERACEAE	*Metalasia muricata*	blombos	dunes	Shrub
ASTERACEAE	*Tarchonanthus camphoratus*	Wild camphor	dunes	Shrub to small tree
CELASTRACEAE	*Cassine peragua*	bastersaffraan	dunes	Shrub to small tree
EBENACEAE	*Euclea racemosa*	seeghwarrie	dunes	Shrub
ERICACEAE	*Erica chloroloma*		dunes	shrub
FABACEAE	Psoralea repens	duine-ertjie	Primary dunes	Groundcover
FABACEAE	*Rhynchosia caribaea*		Dunes	shrub
GENTIANACEAE	*Chironia baccifera*	bitterbessiebos	dunes	Low shrub
GERANIACEAE	*Pelargonium capitatum*	Rose-scented pelargonium	Dunes	Low shrub
LAMIACEAE	Salvia africana-lutea	Bruinsalie	Dunes	Shrub
MESEMBRYANTHEMACEAE	*Carpobrotus acinaciformis*	Sour fig	Dunes	Groundcover
MESEMBRYANTHEMACEAE	*Carpobrotus deliciosus*	perdevy	Rocky shore and dunes	groundcover
OLEACEAE	*Olea capensis* subsp. *capensis*	ysterhout	dunes	Shrub to small tree
POLYGALACEAE	*Polygala myrtifolia*	Septemberbos	Dunes	shrub
POLYGALACEAE	Nylandtia spinosa	skilpadbessie	Dunes	Shrub
RUTACEAE	*Agathosma apiculata*	knoffelboegoe	dunes	Shrub
RUTACEAE	*Agathosma stenopetala*		Dunes	Shrub
THYMELAEACEAE	*Passerina corymbosa*	sandgonnabas	Coastal sands	Shrub
THYMELAEACEAE	*Passerina rigida*	duinegonnabas	dunes	shrub
Monocotyledones				
AMARYLLIDACEAE	*Scadoxus puniceus*	Blood lily	Dunes	bulb
ARACEAE	*Zantedeschia aethiopica*	Arum lily	Sand plain and dunes	Bulb
ASPHODELACEAE	*Trachyandra ciliata*	wildeblomkool	Dunes	Bulb
CYPERACEAE	*Tetraria brachyphylla*		Coastal sands	sedge
POACEAE	*Ehrharta villosa*	pypgras	Primary dunes and coastal sands	Grass
POACEAE	*Merxmuellera cincta* subsp. *sericea*	olifantsgras	Dunes (also wetter parts)	Grass
RESTIONACEAE	*Ischyrolepis leptoclados*	besemriet	Dunes	Restio

Mulching

Mulch should be strewn over the planted areas and this should shade the soil, and provide a source of organic matter and some nutrients, as well as retention of moisture for new plants.

The best source for mulch is locally occurring introduced acacias (e.g. *Acacia saligna* Port Jackson willow) and these should be mulched on site after cutting. Care should be taken not to clear these woody aliens when they are setting seed (October-November).

Maintenance

Newly planted areas should be regularly weeded. Where plant death occurs, new material should be planted out. Plants should also be irrigated during the first summer season. For this purpose a simple above ground irrigation system would prove useful if not essential.

All woody aliens should be removed once they reach knee height (for ease of pulling).

(viii) Coastal corridor and buffers

The negative aspects of locating a nuclear facility at the coast (i.e. on the high water mark) have been discussed by Low (2008) for the planned (now abandoned) PBMR plant at Koeberg. In that study Low (2008) stated: "These habitats are extremely sensitive and fragile and demand great circumspect if both the habitat as well as issues such as maintenance of structures are to be satisfactorily dealt with. A setback line should be implemented ......"

The EIA corridor should be separated from the high-water mark by a coastal corridor and adequate buffer to the sensitive primary dunes and rocky shore at the coast, whichever is the greater. Such a corridor should be underpinned by the following ecological rules or criteria:

- 200 m wide ecological corridor as a minimum width for serving as a conduit for pollinating and fruit-translocating fauna and an enabling area for essential ecological processes, such as dune mobility, pollination, and preservation of major communities;
- Avoidance of the sensitive and rare coastal wetlands and the Langefontein. The latter could be affected by the eastern phase of the facility;
- Avoidance of the sensitive rocky shore community;
- Avoidance of the embryo dunes and semi-mobile parabolics, particularly along the Thysbaai coastline. This would in particular affect the eastern part of the proposed EIA Corridor;
- Whichever line is the furthest from the HWM, an additional buffer of 100 m should be set to protect the sensitive systems discussed above from any long-term impacts the development could have on such systems; and
- All lines would need to be accurately surveyed before the footprint is fine-tuned.

Figure 5.3.9 shows the various lines and the final setback for any development. A possible – and greatly preferred - location for the EIA Corridor is shown in Figure 5.3.10. This locality is in the west of the current EIA corridor and avoids both sensitive dune systems as well as the sensitive, rare and endemic Langefontein wetlands, and is found in parabolic dunes with far greater stability and less rarity.

The importance of keeping a 200 m wide conduit along the coast is illustrated in Figure 5.3.11, as is the use of the alternative siting of the EIA/ HVY corridor. In this way functional linkages could be maintained along the coast, as well as inland.

(ix) Inlet and outlet pipes

The use of inlet and outlet pipes for the intake and removal of sea water and brine from the desalination plant as coolant for the nuclear facility is strongly supported, but with the following provisos;

- Both sets of pipes should be buried to a minimum depth of 2 to 3 m where possible and should not be exposed on the rocky shore. Where pipes are to be placed, excavation should be preceded by a search and rescue operation as discussed above. All useful and rare plants should be removed and stored and/or grown on in the site nursery
- Topsoil should be removed and stockpiled as described above, and used to rehabilitate excavations
- Once excavation and filling is completed, rehabilitation should be carried out, following the recommendations presented above (vii).

(x) Spoil sites

In any excavation and removal of material, the topsoil (minimum 300 mm) should be stored for later use in rehabilitation. Exact methods for this should be detailed in the construction EMP, but piles should not be higher than 1.5 to 2 m to provide aeration.

Given the massive amount of material which would need to be removed from the site, such material should be removed from the area. Three approaches have been suggested in meetings with Eskom:

- Disposal at sea – this would be the most suitable as regards the terrestrial and wetland systems (sand is pumped in a sea water slurry.)
- Removal by conveyor belt to the north of the northern transverse dune system, and deposited on sandstone soils transformed by farming activities (Figures 5.3.3 and 5.3.6). Deposition on the transverse and associated dunes should not be an option and is not supported. However, a temporary conveyor belt constructed across the narrowest of the transverse dunes and depositing sand in a disturbed part of the sandstones north of the dunes could be an option, provided that impacts of such a system are minimised.

Where smaller amounts of fill are involved, such as the inlet and outlet pipes, this could be stored locally but in a previously disturbed locality (-ies). Again, topsoil must be separated from the general fill and stored as recommended in section vii above.

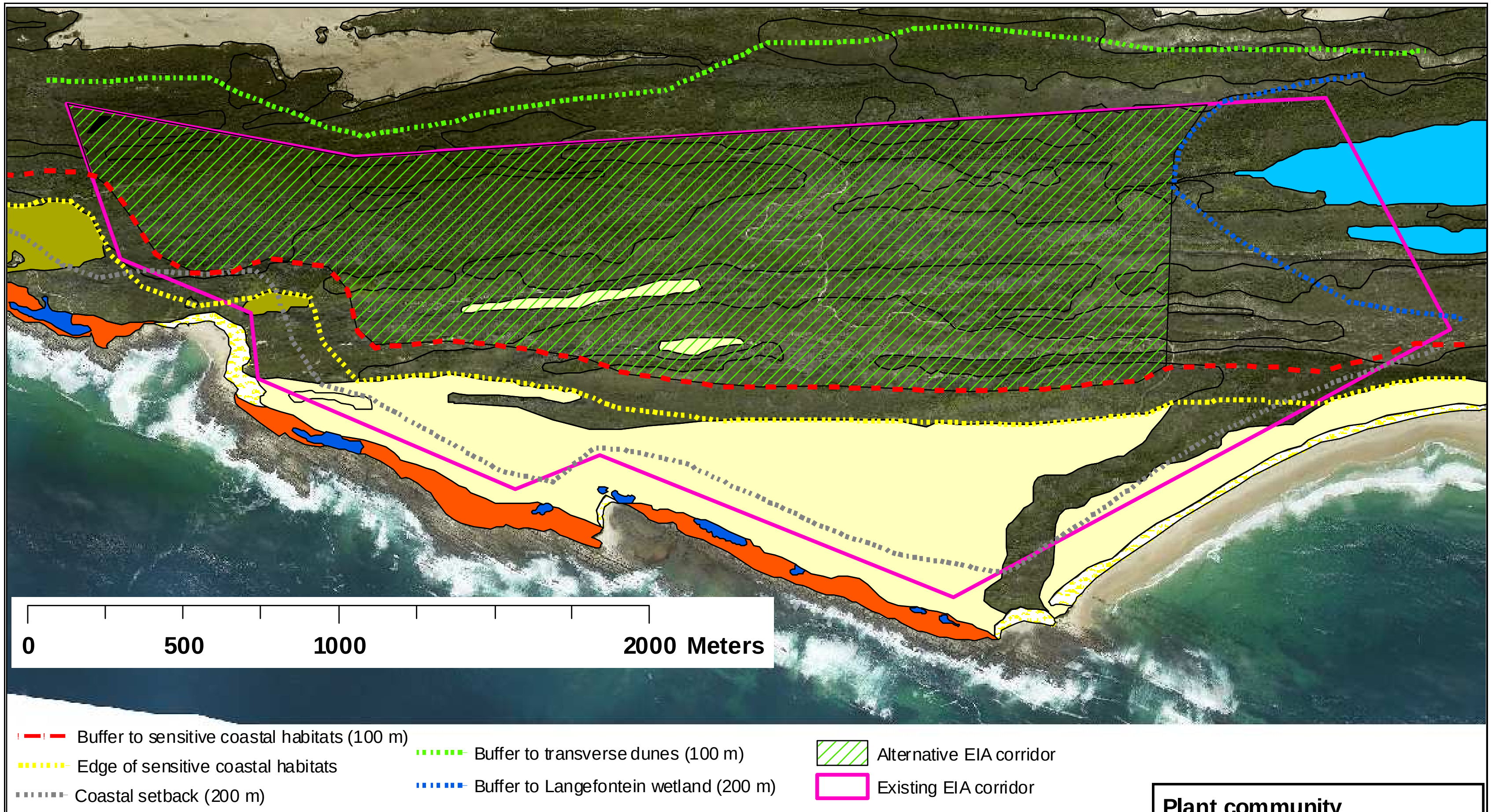


Fig. 5.3.10. Alternative siting for the Thypunt NPS EIA corridor. This locality lies on stable parabolic dunes and avoids the sensitive coastal wetland, dune and limetone habitats, as well as the endemic and sensitive Langefontein wetlands and northern transverse dune system. The latter should be buffered by at least 100 m and the Langeontein by 200 m, but with the connection to the coastal wetlands undeveloped

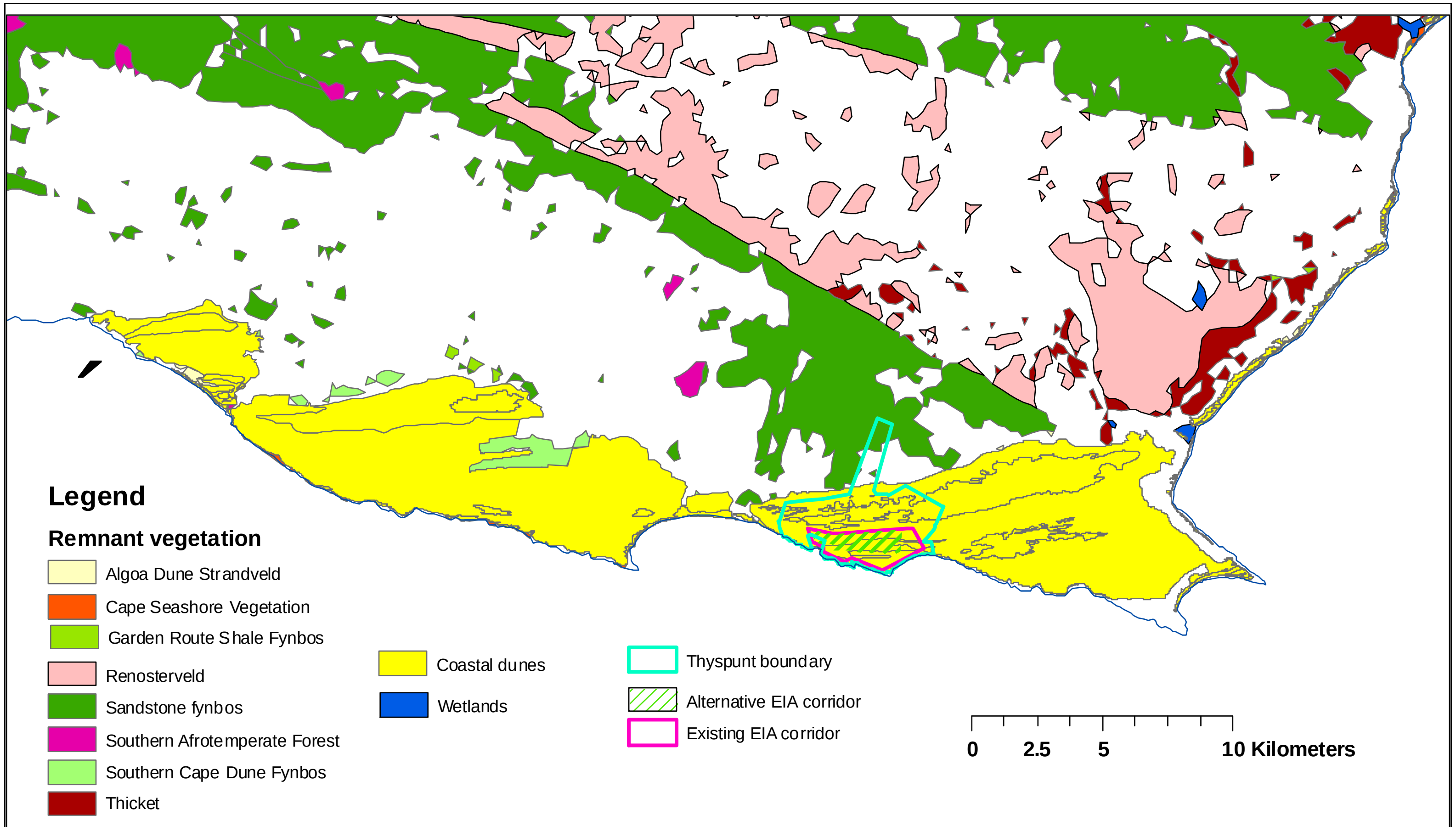


Fig. 5.3.11. Linkages between Thyspunt and the adjacent coastal and inland areas. Location of a NPS facility within the present EIA corridor could have a major negative impact on the coastal corridor if a 200 m width is not provided, and the Langefontein wetland system is not adequately buffered

(xi) Cumulative impacts

To avoid cumulative impacts on habitat and rare species loss, and ecosystem functioning, footprints must be amended to minimise effects on local natural habitats. Rehabilitation – as described above - should be undertaken in all disturbed sites so that long term benefits to habitat quality and general ecosystem functioning are enhanced.

5.3.7 Monitoring

(i) Rehabilitation

Goal: to ensure that rehabilitation with indigenous species is carried out effectively and has long-term sustainability

a. Uninvaded areas

Where habitats have been unnaturally disturbed but are not invaded by *Acacia cyclops* rooikrans, rehabilitation with indigenous species is to be implemented. Such rehabilitation should follow a plan put together by a rehabilitation specialist, and using locally occurring indigenous species. Details of the plan are presented in section vii above. Rehabilitation success should be monitored on a three monthly basis for the first year, and then six monthly until acceptable species densities and cover are achieved.

b. Invaded areas

Areas invaded by rooikrans should be cleared and rehabilitated using indigenous species (see rehabilitation plan in section vii above). Rehabilitation success should be monitored (species density and cover) at three monthly intervals for the first year, and then six monthly until acceptable levels have been reached.

Whilst it is strongly recommended that rooikrans be cleared manually – for both social as well as ecological reasons – individuals removing acacias should be subject to a code of conduct which would govern behaviour on site. Key issues include damage to plants and animals, toilets, fire, and general behaviour to be consistent with that of a nature reserve. Activities of these individuals need to be monitored by the onsite supervisor or conservation manager.

Cleared rooikrans should be mulched for later use in rehabilitation (see section (vii) above).

(ii) Coastal corridor

Goal: to ensure a coastal corridor is created in an appropriate manner and is maintained in the long-term

Implementation of a coastal corridor (see model in Figure 5.3.10) should be a key goal of the development of the nuclear facility. Monitoring must be implemented to ensure that the coastal corridor is maintained in as natural a state as possible. This will include monitoring the rehabilitation of areas which have been excavated for the inlet and outlet pipes and the area immediately alongside the nuclear structure. Rehabilitation with indigenous species should be undertaken following the rehabilitation plan presented above (section (vii) above).

Institution of a functional coastal corridor is closely allied with the re-siting of the EIA corridor (Figure 5.3.10m).

(iii) Relocation and/or growing on of Red Data species

Goal: to ensure that all RD species affected by development are relocated or successfully grown on in a nursery and returned to the wild

Relocation and/or growing on of Red Data species should be included in the site's rehabilitation plan. Key performance criteria would include the reintroduction of RD species into protected areas, either on the site or in nearby nature reserves, or the growing on of such species for introduction through the rehabilitation plan. The bottom line is to ensure there would not be a reduction in the natural densities and populations in each RD species.

(iv) Langefontein and coastal wetlands
(see EIA specialist report on wetlands by the Freshwater Consulting Group)

Goal: to ensure that the water levels and general ecosystem health of these systems are not compromised

A monitoring programme should be put in place which evaluates a) the vigour of the plant communities and individual species component, and b) measures the level of the water. Controls should be used from existing wetlands which are not likely to suffer any harmful effects from the planned development.

(v) State of conservation area

Goal: to ensure that the natural areas of Thyspunt are maintained in a state consistent with that of a well-managed nature reserve.

A conservation area, guaranteed perpetuity regardless of ownership, should be created. A conservation manager should be appointed who will ensure that a management plan is drawn up for the area and implemented. Key performance areas are: alien eradication, rehabilitation, controlled burning, creation of a trail system for the public, control of access and use of the area, control of vehicles entering the area.

6 CONCLUSIONS

6.1 Alternative sites

6.1.1 Duynefontein

Location of the planned facility in the endemic, sensitive and mobile transverse dunes (Figures 5.1.1 and 5.1.2) is not supported. This location echoes the siting of the Koeberg NPS, in the 1970's, in an ecologically unacceptable habitat (mobile transverse dunes and primary dunes at the coast). Further, construction here would provide additional maintenance costs for the facility, given the need to stabilise and control mobile driftsand. Even if a coastal corridor of minimum width 200 m is implemented, "half" a transverse dune would not be able to function optimally.

If the planned footprint is relocated inland, to disturbed and natural land east of the transverse dunes (Figure 5.1.5), and outside the recommended 100 m buffer, then this approach is supported.

Crossing of the rare and sensitive sand plain fynbos to the south-east (Figure 5.1.1) is also a concern and this should be avoided by realigning the powerline routes or crossing this habitat with longer spans. Likewise, the access roads should be realigned to avoid this extremely rare habitat.

6.1.2 Bantamsklip

It is assumed that no development, other than the possible routing of powerlines, would take place north of the Gansbaai road. The present location of the site could impact on rare and sensitive coastal limestone fynbos and also would likely affect the functioning of the transverse dune to the west, and even the smaller system to the east (Figures 5.2.1 and 5.2.2). The coastal sand fynbos which underlies most of the proposed alternative EIA corridor (Figure 5.2.4) is not particularly rare and is well-represented along this coastline. This habitat therefore presents the best opportunity for the development of a NPS at this site.

The main mitigation measure is for the footprint to be located to the north and east of the present site (Figure 5.2.5) and should be preferably located totally in the coastal sand fynbos habitat. However, loss of transverse dunes habitat is not seen as a key impact given the good representation of this system elsewhere along the coast. However, development in this habitat would result in higher maintenance costs for the NPS (the transverse dunes are naturally mobile).

The rules for a coastal corridor should be strictly observed and this includes buffers for the primary and transverse dunes, rocky shore and coastal limestones. There might need to be a reconfiguration of the NPS layout, so that the proposed facility can “fit" between the coastal setback line and the Gansbaai road (Figure 5.2.5).

Where possible, powerline routes, and even access roads, should not cross the northern part of the site, given its high rarity, endemicity and sensitivity. Rather, existing disturbed land should be sought, with such structures being best placed in areas of low conservation worth outside the Bantamsklip site boundary. Again the results of the EIA being conducted on transmission lines leaving the site should guide this process.

6.1.3 Thyspunt

Key impact is the loss of habitat (Figure 5.3.1), albeit of vegetation of low rarity and sensitivity; for good quality habitat loss there is no mitigation, other than indirectly through providing an offset elsewhere on the site or in another area (*sensu* Brownlie, 2007).

Crucial to development on the coast is a setback which satisfies the long-term (i.e. permanent) protection of representative rare habitats as well as ecosystem functioning, at the same time providing a conduit for the movement of fauna between the HWM and the facility. An NPS could be built in the north and west of the EIA Corridor (Figure 5.3.10) and this would substantially reduce impacts on the coastal systems and their functioning.

However, complicating the siting of the facility is the presence of highly sensitive and extremely rare wetlands both at the coast, as well as inland at the Langefontein (Figure 5.3.10). These wetlands should be in no way be compromised by the planned development, either in the construction or operational phases. Likewise, the rare coastal limestones should be avoided at all costs.

Loss of stable dune habitat is not regarded as a key issue as this habitat is not rare. However, there is some cause for concern given the poor conservation status of Algoa Dune Strandveld (4.1%). Southern Cape Dune Fynbos on the other hand is far better protected (>16%) (Rouget *et al.*, 2004). Thus an important positive impact, admittedly potential, arising from the development, would be a well-managed conservation area catering for this habitat as well as the others represented at Thyspunt.

This site is supported, but with the proviso that:

a) The coastal wetlands and limestones are **not in any way compromised**

b) That a functional coastal corridor is created and managed, as part of a bigger conservation area, comprising the remainder of the site.

Eskom should be part of a wider initiative which sees such a conservation area being expanded to include the whole headland bypass dune system between Oyster Bay and Cape St. Francis, despite losses of dune habitat and function at either end of this remarkable system (Figure 5.3.8). The balance (i.e. non-developed part) of the Thyspunt site would form a major contribution to the broader conservation area.

Any powerlines crossing the transverse dunes would need to employ long spans so that pylons do not physically sit on the mobile dunes. In addition it is believed that insufficient understanding of this system could compromise any decision on whether or not to construct structures such as pylon bases in the mobile zone. Such information could come from a study currently being undertaken by Rhodes University. The transverse dune functioning could be compromised in the long-term. In this regard, the abandonment of the proposed south-north road across the transverse dunes is welcomed.

The Eastern Access Road (Figure 5.3.4) does provide some concern, given the importance and endemicity of the longitudinal wetlands draining towards Cape St. Francis, but mitigation should provide for a satisfactory alignment. For the Western Access Road (Figure 5.3.5), whist mitigation could well lead to the avoidance of many if not most of the rare and sensitive dune and wetland habitats likely to be encountered along the present alignment, the road is highly likely to negatively impact the functioning of the western part of the transverse dune system adjacent to Oyster Bay, and is therefore not strongly supported.

The location of the HV Yard (Figure 5.3.3) is considered acceptable, providing the footprint is aligned to occupy previously farmed land and otherwise degraded sandstone fynbos.

6.2 Impacts that cannot be mitigated

For **Duynefontein,** construction in an endemic transverse dune system should be excluded as a possibility for a NPS, if the footprint is not moved to outside (eastwards) this habitat. If the latter occurs, then Duynefontein becomes an acceptable site, given that it currently houses a nuclear facility and that parts of the site are already fairly degraded. The geomorphologist's specialist report (Werner Illenberger & Associates) (WIA) refers to Tinley's (1985) comment that the Yzerfontein (north of Duynefontein) and Atlantis (formed in part by the Duynefontein dune system) corridor dunefields are for the most part heavily impacted. This is no longer true as extensive alien clearing has been undertaken, at least in the latter system (Duynefontein, and locally in Witzand, across the R27 road). WIA states that "......losing half the (transverse) dunes will not compromise the dune functioning, it will only reduce its area". However, as the transverse dunes system at Duynefontein has now been effectively re-mobilised due to alien clearing, this assertion needs to be tested by on site monitoring and assessment of current dune movement. The observation that significant sand movement from the south-west should be taken into account before a final decision is taken on the fate of this endemic system.
For **Bantamsklip**, provided there is a major amendment to the location and design of the NPS footprint, then this would be an acceptable site.

If compromising the functioning of the wetlands at **Thyspunt** cannot be avoided, then this site is not recommended for the establishment of a NPS, especially as these systems are endemic to this coast, and the Langefontein is a "one-of-a-kind", endemic system. If the engineers could satisfy the natural requirements for water supply – both in quality and seasonally to these wetlands suites, then Thyspunt might be a possibility.

6.3 In summary

With no mitigation none of the sites is deemed suitable for construction of a nuclear facility. If, however, stringent mitigation as discussed above is implemented, then all sites have potential for the construction of a NPS facility. ***Key issues would be the relocation of the Koeberg footprint to the east of*** the sensitive ***transverse dunes, and*** assurance *that mitigation* measures ***for the*** Langefontein ***and coastal wetlands at*** Thyspunt ***would be adequate to guard against*** compromising ***these rare and*** sensitive systems

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ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED NUCLEAR POWER STATION ('NUCLEAR 1') and ASSOCIATED INFRASTRUCTURE

Botany and Dune Ecology Impact Assessment

APPENDICES

A BARRIE LOW

COASTEC

J27035

UPDATED DECEMBER 2009

APPENDIX 4.1.1. PLANT SPECIES RECORDED FROM DUYNEFONTEIN: INDIVIDUAL LISTS

NT: Near Threatened; R: Rare, VU: vulnerable EN: Endangered, CR: Critically Endangered

LC: Least Concern; DD: Data Deficient; De: Declining

COMMUNITY K1: PRIMARY DUNES

Division: Anthophyta

Class: Dicotyledones

Total named species: **24**
Total genera: **21**
Total families: **13**
Total red data species: **3**
Total introduced species: **2**

AIZOACEAE
Tetragonia
decumbens Mill.
APIACEAE
Dasispermum
suffruticosum (P.J.Bergius) B.L.Burtt
ASTERACEAE
Arctotheca
populifolia (P.J.Bergius) Norl.
Didelta
carnosa (L.f.) Aiton var. tomentosa
Helichrysum
crispum (L.) D.Don.
niveum (L.) Less.
Senecio
elegans L.
cf. maritimus L.
Tripteris
dentata (Burm.f.) O.Hoffm.
CRASSULACEAE
Crassula
cf. glomerata P.J.Bergius
FABACEAE
Psoralea
repens L. NT
GERANIACEAE
Pelargonium
capitatum (L.) L'Hér.
MESEMBRYANTHEMACEAE
Amphibolia
laevis (Aiton) H.E.K.Hartmann LC
Carpobrotus
acinaciformis (L.) L.Bolus LC
Ruschia
indecora (L.Bolus) Schwantes EN
MYRICACEAE
Morella
cordifolia (L.) Killick
SCROPHULARIACEAE
Hemimeris
racemosa (Houtt.) Merr. LC
Manulea
tomentosa (L.) L.
THYMELAEACEAE
Passerina
ericoides L. VU

Division: Anthophyta
Class: Monocotyledones

ASPHODELACEAE
Trachyandra
ciliata (L.f.) Kunth LC
divaricata (Jacq.) Kunth
CYPERACEAE
Ficinia
lateralis (Vahl) Kunth
Isolepis
cf. antarctica (L.) Roem. & Schult.
POACEAE
Cladoraphis
cyperoides (Thunb.) S.M.Phillips

COMMUNITY K2: FOREDUNES

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
  Tetragonia
    fruticosa L.
ANACARDIACEAE
  Rhus
    glauca Thunb.
    laevigata L.f.
APIACEAE
  Dasispermum
    suffruticosum (P.J.Bergius) B.L.Burtt
APOCYNACEAE
  Cynanchum
    obtusifolium L.f.
ASTERACEAE
  Chrysanthemoides
    incana (Burm.f.) Norl.
    cf. monilifera (L.) Norl.
  Cineraria
    geifolia (L.) L.
  Didelta
    carnosa (L.f.) Aiton var. tomentosa
  Gazania
    cf. pectinata (Thunb.) Hartweg
  Metalasia
    muricata (L.) D.Don.
  Othonna
    coronopifolia L.
    filicaulis Jacq.
  Senecio
    elegans L.
    cf. maritimus L.
  Tripteris
    dentata (Burm.f.) O.Hoffm.
CARYOPHYLLACEAE
  Silene
    undulata Aiton
CELASTRACEAE
  Pterocelastrus
    tricuspidatus (Lam.) Sond. LC
CRASSULACEAE
  Cotyledon
    orbiculata L.
  Crassula
    glomerata P.J.Bergius
  Tylecodon
    paniculatus (L.f.) Toelken
CUCURBITACEAE
  Kedrostis
    nana (Lam.) Cogn.
EUPHORBIACEAE
  Euphorbia
    burmannii E.Mey. ex Boiss.
    caput-medusae L.
GENTIANACEAE
  Chironia
    baccifera L.
GERANIACEAE
  Pelargonium
    capitatum (L.) L'Hér.
MESEMBRYANTHEMACEAE
  Amphibolia
    laevis (Aiton) H.E.K.Hartmann LC
  Carpobrotus
    acinaciformis (L.) L.Bolus LC
  Jordaaniella
    dubia (Haw.) H.E.K.Hartmann LC
  Ruschia
    macowanii (L.Bolus) Schwantes
OROBANCHACEAE
  Hyobanche
    sanguinea L.
PLUMBAGINACEAE
  Afrolimon
    perigrinum (P.J.Bergius) Lincz.
RHAMNACEAE
  Phylica
    ericoides L.
SANTALACEAE
  Osyris
    compressa (P.J.Bergius) A.DC.
SCROPHULARIACEAE
  Nemesia
    affinis Benth.
  Oftia
    africana (L.) Bocq.
SOLANACEAE
  Solanum
    guineense L.
URTICACEAE
  Didymodoxa
    capensis (L.f.) Friis & Wilmot-Deare
VISCACEAE
  Viscum
    capense L.f.
ZYGOPHYLLACEAE
  Roepera
    flexuosum Eckl. & Zeyh.
    morgsana L.

Division: Anthophyta

Class: Monocotyledones

ASPHODELACEAE
  Trachyandra
    divaricata (Jacq.) Kunth
CYPERACEAE
  Isolepis
    antarctica (L.) Roem. & Schult.
HYACINTHACEAE
  Albuca
    maxima Burm.f.
IRIDACEAE
  Gladiolus
    cunonius (L.) Gaertn.
POACEAE
  Ehrharta
    villosa Schult.f. var. villosa

Total named species:	**49**
Total genera:	**42**
Total families:	**28**
Total red data species:	**0**
Total introduced species:	**1**

COMMUNITY K3: TRANSVERSE DUNES

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
- Rhus
  - laevigata L.f.

APIACEAE
- Dasispermum
  - suffruticosum (P.J.Bergius) B.L.Burtt

APOCYNACEAE
- Cynanchum
  - africanum (L.) Hoffmanns.

ASTERACEAE
- Chrysanthemoides
  - cf. incana (Burm.f.) Norl.
- Cineraria
  - geifolia (L.) L.
- Didelta
  - carnosa (L.f.) Aiton var. tomentosa
- Helichrysum
  - cochleariforme DC. NT
  - niveum (L.) Less.
  - patulum (L.) D.Don.
  - cf. revolutum (Thunb.) Less.
- Metalasia
  - muricata (L.) D.Don.
- Nidorella
  - cf. foetida (L.) DC.
- Plecostachys
  - serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
- Senecio
  - burchellii DC.
  - elegans L.
  - halimifolius L.
  - littoreus Thunb.
- Seriphium
  - plumosum L.

CARYOPHYLLACEAE
- Cerastium
  - cf. capense Sond.

CRASSULACEAE
- Crassula
  - cf. glomerata P.J.Bergius

FABACEAE
- Lessertia
  - cf. frutescens (L.) Goldblatt & J.C.Manning
- Otholobium
  - bracteolatum (Eckl. & Zeyh.) C.H.Stirt.
- Psoralea
  - repens L. NT

GENTIANACEAE
- Chironia
  - baccifera L.

GERANIACEAE
- Pelargonium
  - capitatum (L.) L'Hér.

MESEMBRYANTHEMACEAE
- Carpobrotus
  - acinaciformis (L.) L.Bolus LC
- Ruschia
  - indecora (L.Bolus) Schwantes EN
  - macowanii (L.Bolus) Schwantes

MYRICACEAE
- Morella
  - cordifolia (L.) Killick

POLYGALACEAE
- Nylandtia
  - spinosa (L.) Dumort.

SANTALACEAE
- Thesidium
  - fragile (Thunb.) Sond.

SCROPHULARIACEAE
- Dischisma
  - cf. ciliatum (P.J.Bergius) Choisy
- Lyperia
  - tristis (L.f.) Benth.
- Manulea
  - tomentosa (L.) L.
- Zaluzianskya
  - villosa F.W.Schmidt

THYMELAEACEAE
- Passerina
  - ericoides L. VU

VISCACEAE
- Viscum
  - capense L.f.

ZYGOPHYLLACEAE
- Roepera
  - flexuosum Eckl. & Zeyh.

Division: Anthophyta

Class: Monocotyledones

ASPARAGACEAE
- Asparagus
  - capensis L.

ASPHODELACEAE
- Trachyandra
  - divaricata (Jacq.) Kunth

COLCHICACEAE
- Ornithoglossum
  - viride (L.f.) Aiton

CYPERACEAE
- Ficinia
  - lateralis (Vahl) Kunth
- Hellmuthia
  - membranacea (Thunb.) R.Haynes & K.Lye

HYACINTHACEAE
- Albuca
  - maxima Burm.f.

ORCHIDACEAE
- Disperis
  - cf. villosa (L.f.) Sw.

POACEAE
- Cladoraphis
  - cyperoides (Thunb.) S.M.Phillips
- Ehrharta
  - villosa Schult.f. var. villosa
- Imperata
  - cylindrica (L.) Raeuschel
- Pentaschistis
  - cf. pallida (Thunb.) H.P.Linder LC

RESTIONACEAE
- Elegia
  - tectorum (L.f.) Raf.
- Thamnochortus
  - spicigerus (Thunb.) Spreng.

Total named species:	**54**
Total genera:	**46**
Total families:	**25**
Total red data species:	**4**
Total introduced species:	**1**

COMMUNITY K5: DWARF THICKET IN SOUTH

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
crenata Thunb.
glauca Thunb.
laevigata L.f.
APIACEAE
Capnophyllum
cf. africanum (L.) Gaertn. NT
Torilis
arvensis (Huds.) Link
APOCYNACEAE
Cynanchum
cf. africanum (L.) Hoffmanns.
Microloma
sagittatum (L.) R.Br.
ASTERACEAE
Arctotheca
calendula (L.) Levyns
Chrysanthemoides
incana (Burm.f.) Norl.
Cotula
cf. duckittiae (L.Bolus) Bremer & Humphries VU
Dimorphotheca
pluvialis (L.) Moench
Gazania
pectinata (Thunb.) Hartweg
Metalasia
muricata (L.) D.Don.
Othonna
coronopifolia L.
Senecio
cf. arenarius Thunb.
elegans L.
BRASSICACEAE
Heliophila
africana (L.) Marais
CAMPANULACEAE
Cyphia
crenata (Thunb.) C.Presl
CELASTRACEAE
Putterlickia
pyracantha (L.) Szyszyl.
CRASSULACEAE
Cotyledon
orbiculata L.
Crassula
dichotoma L.
glomerata P.J.Bergius
cf. tomentosa Thunb.
EBENACEAE
Euclea
racemosa Murray
EUPHORBIACEAE
Clutia
daphnoides Lam.
Euphorbia
caput-medusae L.
mauritanica L.
FABACEAE
Lebeckia
cf. spinescens Harv.
GERANIACEAE
Pelargonium
gibbosum (L.) L'Hér.
senecioides L'Hér.
LAMIACEAE
Salvia
africana-lutea L.
MALVACEAE
Hermannia
pinnata L.
MENISPERMACEAE
Cissampelos
capensis L.f.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
Jordaaniella
dubia (Haw.) H.E.K.Hartmann LC
Ruschia
macowanii (L.Bolus) Schwantes
NEURADACEAE
Grielum
grandiflorum (L.) Druce
OLEACEAE
Olea
exasperata Jacq.
OXALIDACEAE
Oxalis
cf. polyphylla Jacq.
PLUMBAGINACEAE
Afrolimon
perigrinum (P.J.Bergius) Lincz.
POLYGALACEAE
Nylandtia
spinosa (L.) Dumort.
RUBIACEAE
Anthospermum
prostratum Sond.
Galium
tomentosum Thunb.
SANTALACEAE
Thesium
aggregatum A.W.Hill
SCROPHULARIACEAE
Dischisma
ciliatum (P.J.Bergius) Choisy
Hemimeris
sabulosa L.f.
Manulea
thyrsiflora L.f.
Nemesia
affinis Benth.
Zaluzianskya
villosa F.W.Schmidt
SOLANACEAE
Solanum
guineense L.
URTICACEAE
Didymodoxa
cf. capensis (L.f.) Friis & Wilmot-Deare
VISCACEAE
Viscum
capense L.f.
ZYGOPHYLLACEAE
Roepera
flexuosum Eckl. & Zeyh.
morgsana L.

COMMUNITY K5: DWARF THICKET IN SOUTH (contd.)

Division: Anthophyta
Class: Monocotyledones

ASPARAGACEAE
  Asparagus
    asparagoides (L.) Druce
    capensis L.
ASPHODELACEAE
  Trachyandra
    ciliata (L.f.) Kunth LC
    revoluta (L.) Kunth
CYPERACEAE
  Ficinia
    lateralis (Vahl) Kunth
HYACINTHACEAE
  Albuca
    cf. flaccida Jacq.
    cf. maxima Burm.f.
IRIDACEAE
  Babiana
    tubulosa (Burm.f.) Ker Gawl. var. tubulosa VU
  Ferraria
    crispa Burm. subsp. crispa LC
  Melasphaerula
    ramosa (L.) N.E.Br.
POACEAE
  Ehrharta
    calycina Sm.
    villosa Schult.f. var. villosa
  Pentaschistis
    cf. pallida (Thunb.) H.P.Linder LC
RESTIONACEAE
  Thamnochortus
    spicigerus (Thunb.) Spreng.

Total named species:	**71**
Total genera:	**59**
Total families:	**37**
Total red data species:	**3**
Total introduced species:	**2**

COMMUNITY K6: DWARF THICKET IN NORTH

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
glauca Thunb.
laevigata L.f.
APIACEAE
Peucedanum
typicum (Eckl. & Zeyh.) B.L.Burtt
APOCYNACEAE
Cynanchum
africanum (L.) Hoffmanns.
cf. obtusifolium L.f.
ASTERACEAE
Chrysanthemoides
incana (Burm.f.) Norl.
cf. monilifera (L.) Norl.
Cineraria
geifolia (L.) L.
Gazania
cf. pectinata (Thunb.) Hartweg
Helichrysum
revolutum (Thunb.) Less.
Othonna
coronopifolia L.
filicaulis Jacq.
Senecio
arenarius Thunb.
elegans L.
littoreus Thunb.
cf. maritimus L.
Tripteris
dentata (Burm.f.) O.Hoffm.
BRASSICACEAE
Heliophila
africana (L.) Marais
cf. linearis (Thunb.) DC. var. linearifolia
CAMPANULACEAE
Cyphia
crenata (Thunb.) C.Presl
CARYOPHYLLACEAE
Silene
undulata Aiton
CELASTRACEAE
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Putterlickia
pyracantha (L.) Szyszyl.
CRASSULACEAE
Cotyledon
orbiculata L.
Crassula
glomerata P.J.Bergius
muscosa L.
tomentosa Thunb.
Tylecodon
paniculatus (L.f.) Toelken
CUCURBITACEAE
Kedrostis
nana (Lam.) Cogn.
EBENACEAE
Euclea
racemosa Murray
EUPHORBIACEAE
Clutia
daphnoides Lam.
Euphorbia
burmannii E.Mey. ex Boiss.
caput-medusae L.
mauritanica L.
FABACEAE
Indigofera
heterophylla Thunb.
Otholobium
bracteolatum (Eckl. & Zeyh.) C.H.Stirt.
GERANIACEAE
Pelargonium
gibbosum (L.) L'Hér.
LAMIACEAE
Salvia
africana-lutea L.
MENISPERMACEAE
Cissampelos
capensis L.f.
MESEMBRYANTHEMACEAE
Jordaaniella
dubia (Haw.) H.E.K.Hartmann LC
Ruschia
macowanii (L.Bolus) Schwantes
OLEACEAE
Olea
exasperata Jacq.
OXALIDACEAE
Oxalis
obtusa Jacq. LC
PLUMBAGINACEAE
Afrolimon
perigrinum (P.J.Bergius) Lincz.
RHAMNACEAE
Phylica
ericoides L.
RUBIACEAE
Galium
tomentosum Thunb.
SANTALACEAE
Thesium
aggregatum A.W.Hill
SCROPHULARIACEAE
Hebenstretia
repens Jaroscz
Hemimeris
racemosa (Houtt.) Merr. LC
Nemesia
affinis Benth.
Phyllopodium
phyllopodioides (Schltr.) Hilliard
Zaluzianskya
villosa F.W.Schmidt
SOLANACEAE
Solanum
guineense L.
nigrum L.
URTICACEAE
Didymodoxa
capensis (L.f.) Friis & Wilmot-Deare
ZYGOPHYLLACEAE
Roepera
flexuosum Eckl. & Zeyh.
morgsana L.

COMMUNITY K6: DWARF THICKET IN NORTH (contd.)

Division: Anthophyta
Class: Monocotyledones

ASPARAGACEAE
  Asparagus
    aethiopicus L.
    capensis L.
ASPHODELACEAE
  Trachyandra
    ciliata (L.f.) Kunth LC
    divaricata (Jacq.) Kunth
CYPERACEAE
  Ficinia
    indica (Lam.) Pfeiffer
HYACINTHACEAE
  Albuca
    maxima Burm.f.
IRIDACEAE
  Babiana
    tubulosa (Burm.f.) Ker Gawl. VU
  Ferraria
    crispa Burm. subsp. crispa LC
  Gladiolus
    cunonius (L.) Gaertn.
  Melasphaerula
    ramosa (L.) N.E.Br.
POACEAE
  Ehrharta
    cf. calycina Sm.
    villosa Schult.f.

Total named species:	**71**
Total genera:	**53**
Total families:	**34**
Total red data species:	**1**
Total introduced species:	**1**

COMMUNITY K7: THICKET ON PARABOLIC DUNES IN NORTH

Division: Anthophyta
Class: Dicotyledones

AIZOACEAE
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
crenata Thunb.
glauca Thunb.
laevigata L.f.
lucida L.
APIACEAE
Chamarea
capensis (Thunb.) Eckl. & Zeyh.
Sonderina
caruifolia (Sond.) H.Wolff DD
Torilis
arvensis (Huds.) Link
APOCYNACEAE
Cynanchum
africanum (L.) Hoffmanns.
Microloma
sagittatum (L.) R.Br.
ASTERACEAE
Arctotheca
calendula (L.) Levyns
Chrysanthemoides
incana (Burm.f.) Norl.
monilifera (L.) Norl. subsp. pisifera (L.) Norl.
Cineraria
geifolia (L.) L.
Cotula
turbinata L.
Didelta
carnosa (L.f.) Aiton var. tomentosa
Dimorphotheca
pluvialis (L.) Moench
Gazania
pectinata (Thunb.) Hartweg
Helichrysum
dasyanthum (Willd.) Sweet
niveum (L.) Less.
cf. revolutum (Thunb.) Less.
Metalasia
muricata (L.) D.Don.
Othonna
coronopifolia L.
filicaulis Jacq.
Senecio
cf. arenarius Thunb.
burchellii DC.
elegans L.
littoreus Thunb.
scapiflorus (L'Her.) C.A.Sm.
BORAGINACEAE
Amsinckia
retrorsa Suksd.
BRASSICACEAE
Heliophila
africana (L.) Marais
CAMPANULACEAE
Cyphia
crenata (Thunb.) C.Presl
CARYOPHYLLACEAE
Cerastium
cf. capense Sond.
CELASTRACEAE
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Putterlickia
pyracantha (L.) Szyszyl.
CRASSULACEAE
Crassula
glomerata P.J.Bergius
EBENACEAE
Euclea
racemosa Murray
EUPHORBIACEAE
Clutia
daphnoides Lam.
Euphorbia
caput-medusae L. subsp. marlothiana N.E.Br. V
mauritanica L.
FABACEAE
Lessertia
cf. excisa DC.
Otholobium
bracteolatum (Eckl. & Zeyh.) C.H.Stirt.
FUMARIACEAE
Cysticapnos
vesicaria (L.) Fedde
GENTIANACEAE
Chironia
baccifera L.
GERANIACEAE
Pelargonium
capitatum (L.) L'Hér.
myrrhifolium (L.) L'Hér.
senecioides L'Hér.
LAMIACEAE
Salvia
africana-lutea L.
MALVACEAE
Hermannia
pinnata L.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
Jordaaniella
dubia (Haw.) H.E.K.Hartmann LC
Ruschia
indecora (L.Bolus) Schwantes EN
macowanii (L.Bolus) Schwantes
NEURADACEAE
Grielum
grandiflorum (L.) Druce
OLEACEAE
Olea
exasperata Jacq.
OROBANCHACEAE
Hyobanche
sanguinea L.
OXALIDACEAE
Oxalis
obtusa Jacq. LC
PLUMBAGINACEAE
Afrolimon
perigrinum (P.J.Bergius) Lincz.
POLYGALACEAE
Nylandtia
spinosa (L.) Dumort.
RHAMNACEAE
Phylica
ericoides L.

COMMUNITY K7: THICKET ON PARABOLIC DUNES IN NORTH (contd.)

RUBIACEAE
Anthospermum
prostratum Sond.
Galium
tomentosum Thunb.
RUTACEAE
Agathosma
cf. serpyllacea Licht. ex Roem. & Schult. LC
SANTALACEAE
Osyris
compressa (P.J.Bergius) A.DC.
Thesium
aggregatum A.W.Hill
cf. spicatum L.
SCROPHULARIACEAE
Diascia
cf. diffusa Benth.
Dischisma
cf. ciliatum (P.J.Bergius) Choisy
Hebenstretia
repens Jaroscz
Hemimeris
racemosa (Houtt.) Merr. LC
sabulosa L.f.
Lyperia
lychnidea (L.) Druce
tristis (L.f.) Benth.
Manulea
cf. tomentosa (L.) L.
Nemesia
affinis Benth.
Zaluzianskya
villosa F.W.Schmidt
SOLANACEAE
Solanum
guineense L.
THYMELAEACEAE
Passerina
cf. paleacea Wikstr.
URTICACEAE
Didymodoxa
capensis (L.f.) Friis & Wilmot-Deare
VISCACEAE
Viscum
capense L.f.
ZYGOPHYLLACEAE
Roepera
flexuosum Eckl. & Zeyh.
morgsana L.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Haemanthus
coccineus L.
ASPARAGACEAE
Asparagus
asparagoides (L.) Druce
capensis L.
ASPHODELACEAE
Trachyandra
ciliata (L.f.) Kunth LC
divaricata (Jacq.) Kunth
falcata (L.f.) Kunth
COLCHICACEAE
Ornithoglossum
viride (L.f.) Aiton
CYPERACEAE
Ficinia
indica (Lam.) Pfeiffer
Isolepis
antarctica (L.) Roem. & Schult.
marginata (Thunb.) A.Dietr.
HYACINTHACEAE
Albuca
maxima Burm.f.
IRIDACEAE
Babiana
tubulosa (Burm.f.) Ker Gawl. VU
Ferraria
cf. crispa Burm.
Melasphaerula
ramosa (L.) N.E.Br.
Romulea
obscura Klatt
ORCHIDACEAE
Corycium
crispum (Thunb.) Sw.
Disperis
villosa (L.f.) Sw.
Satyrium
cf. carneum (Dryand.) Sims NT
POACEAE
Cladoraphis
cyperoides (Thunb.) S.M.Phillips
Ehrharta
brevifolia Schrad. var. brevifolia
cf. delicatula (Nees) Stapf
longiflora J.E.Sm.
villosa Schult.f. var. villosa
Pentaschistis
pallida (Thunb.) H.P.Linder LC
RESTIONACEAE
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder
Thamnochortus
spicigerus (Thunb.) Spreng.

Total named species:	**108**
Total genera:	**82**
Total families:	**46**
Total red data species:	**4**
Total introduced species:	**0**

COMMUNITY K8: THICKET ON EASTERN DEFLATED PARABOLIC DUNES

Division: Anthophyta
Class: Dicotyledones

AIZOACEAE
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
glauca Thunb.
laevigata L.f.
lucida L.
APIACEAE
Chamarea
capensis (Thunb.) Eckl. & Zeyh.
Sonderina
caruifolia (Sond.) H.Wolff DD
Torilis
arvensis (Huds.) Link
APOCYNACEAE
Cynanchum
africanum (L.) Hoffmanns.
obtusifolium L.f.
Microloma
sagittatum (L.) R.Br.
ASTERACEAE
Arctotheca
calendula (L.) Levyns
Arctotis
leptorhiza DC.
Chrysanthemoides
incana (Burm.f.) Norl.
Cotula
cf. duckittiae (L.Bolus) Bremer & Humphries VU
Gazania
cf. pectinata (Thunb.) Hartweg
Helichrysum
cf. dasyanthum (Willd.) Sweet
niveum (L.) Less.
Metalasia
muricata (L.) D.Don.
Othonna
coronopifolia L.
filicaulis Jacq.
Senecio
cf. arenarius Thunb.
elegans L.
Steirodiscus
cf. tagetes (L.) Schltr. VU
BRASSICACEAE
Heliophila
africana (L.) Marais
coronopifolia L.
refracta Sond.
CAMPANULACEAE
Cyphia
crenata (Thunb.) C.Presl
CARYOPHYLLACEAE
Silene
undulata Aiton
CELASTRACEAE
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Putterlickia
pyracantha (L.) Szyszyl.
CRASSULACEAE
Cotyledon
orbiculata L.
Crassula
cf. glomerata P.J.Bergius
EBENACEAE
Euclea
racemosa Murray
EUPHORBIACEAE
Euphorbia
burmannii E.Mey. ex Boiss.
caput-medusae L. subsp. marlothiana N.E.Br. V
mauritanica L.
FABACEAE
Otholobium
bracteolatum (Eckl. & Zeyh.) C.H.Stirt.
FUMARIACEAE
Cysticapnos
vesicaria (L.) Fedde
GENTIANACEAE
Chironia
baccifera L.
GERANIACEAE
Pelargonium
gibbosum (L.) L'Hér.
cf. senecioides L'Hér.
LAMIACEAE
Salvia
africana-lutea L.
Stachys
cf. aethiopica L.
MALVACEAE
Hermannia
pinnata L.
MENISPERMACEAE
Cissampelos
capensis L.f.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
Jordaaniella
dubia (Haw.) H.E.K.Hartmann LC
Ruschia
macowanii (L.Bolus) Schwantes
MOLLUGINACEAE
Pharnaceum
lanatum Bartl.
microphyllum L.f.
NEURADACEAE
Grielum
grandiflorum (L.) Druce
OLEACEAE
Olea
exasperata Jacq.
OXALIDACEAE
Oxalis
obtusa Jacq. LC
PLUMBAGINACEAE
Afrolimon
perigrinum (P.J.Bergius) Lincz.
POLYGALACEAE
Nylandtia
spinosa (L.) Dumort.
POLYGONACEAE
Emex
australis Steinh.
RHAMNACEAE
Phylica
ericoides L.
RUBIACEAE
Anthospermum
prostratum Sond.

COMMUNITY K8: THICKET ON EASTERN DEFLATED PARABOLIC DUNES

Galium
tomentosum Thunb.
SANTALACEAE
Thesium
cf. aggregatum A.W.Hill
virgatum Lam.
SCROPHULARIACEAE
Hebenstretia
repens Jaroscz
Hemimeris
racemosa (Houtt.) Merr. LC
Nemesia
affinis Benth.
Zaluzianskya
villosa F.W.Schmidt
SOLANACEAE
Solanum
cf. africanum Mill. LC
guineense L.
THYMELAEACEAE
Passerina
cf. paleacea Wikstr.
URTICACEAE
Didymodoxa
capensis (L.f.) Friis & Wilmot-Deare
VISCACEAE
Viscum
capense L.f.
ZYGOPHYLLACEAE
Roepera
flexuosum Eckl. & Zeyh.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Brunsvigia
orientalis (L.) Aiton ex Eckl.
Haemanthus
coccineus L.
cf. pubescens L.f. subsp. pubescens
ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
ASPARAGACEAE
Asparagus
asparagoides (L.) Druce
capensis L.
ASPHODELACEAE
Trachyandra
ciliata (L.f.) Kunth LC
CYPERACEAE
Ficinia
cf. indica (Lam.) Pfeiffer
Hellmuthia
membranacea (Thunb.) R.Haynes & K.Lye
Isolepis
antarctica (L.) Roem. & Schult.
HYACINTHACEAE
Albuca
maxima Burm.f.
Lachenalia
rubida Jacq.
ORCHIDACEAE
Satyrium
carneum (Dryand.) Sims NT
RESTIONACEAE
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder
Thamnochortus
spicigerus (Thunb.) Spreng.

Total named species:	**88**
Total genera:	**71**
Total families:	**44**
Total red data species:	**4**
Total introduced species:	**1**

COMMUNITY K9: CALCRETE

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
Rhus
glauca Thunb.
laevigata L.f.
lucida L.
APIACEAE
Chamarea
capensis (Thunb.) Eckl. & Zeyh.
Torilis
arvensis (Huds.) Link
APOCYNACEAE
Cynanchum
africanum (L.) Hoffmanns.
ASTERACEAE
Chrysanthemoides
incana (Burm.f.) Norl.
Cineraria
geifolia (L.) L.
Helichrysum
cf. dasyanthum (Willd.) Sweet
niveum (L.) Less.
Othonna
coronopifolia L.
Senecio
cf. arenarius Thunb.
elegans L.
CAMPANULACEAE
Cyphia
crenata (Thunb.) C.Presl
CUCURBITACEAE
Kedrostis
nana (Lam.) Cogn.
EBENACEAE
Euclea
racemosa Murray
EUPHORBIACEAE
Clutia
daphnoides Lam.
Euphorbia
caput-medusae L.
mauritanica L.
GENTIANACEAE
Chironia
baccifera L.
LAMIACEAE
Salvia
africana-lutea L.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
Jordaaniella
dubia (Haw.) H.E.K.Hartmann LC
OLEACEAE
Olea
exasperata Jacq.
PLUMBAGINACEAE
Afrolimon
perigrinum (P.J.Bergius) Lincz.
RUBIACEAE
Galium
tomentosum Thunb.
RUTACEAE
Agathosma
cf. imbricata (L.) Willd.
SCROPHULARIACEAE
Dischisma
cf. ciliatum (P.J.Bergius) Choisy
Nemesia
affinis Benth.
Zaluzianskya
villosa F.W.Schmidt
URTICACEAE
Didymodoxa
capensis (L.f.) Friis & Wilmot-Deare
VISCACEAE
Viscum
capense L.f.
ZYGOPHYLLACEAE
Roepera
flexuosum Eckl. & Zeyh.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Haemanthus
coccineus L.
ASPARAGACEAE
Asparagus
cf. asparagoides (L.) Druce
capensis L.
ASPHODELACEAE
Trachyandra
ciliata (L.f.) Kunth LC
CYPERACEAE
Ficinia
indica (Lam.) Pfeiffer
Isolepis
cf. antarctica (L.) Roem. & Schult.
POACEAE
Pentaschistis
cf. pallida (Thunb.) H.P.Linder LC
RESTIONACEAE
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder
Thamnochortus
spicigerus (Thunb.) Spreng.

Total named species:	**43**
Total genera:	**37**
Total families:	**25**
Total red data species:	**0**
Total introduced species:	**1**

COMMUNITY K10: SAND PLAIN FYNBOS

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
Aizoon
paniculatum L.
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
glauca Thunb.
laevigata L.f.
lucida L.
APIACEAE
Torilis
arvensis (Huds.) Link
APOCYNACEAE
Cynanchum
cf. africanum (L.) Hoffmanns.
ASTERACEAE
Arctotis
leptorhiza DC.
Chrysanthemoides
incana (Burm.f.) Norl.
Conyza
scabrida DC.
Cotula
cf. duckittiae (L.Bolus) Bremer & Humphries VU
turbinata L.
Disparago
ericoides (P.J.Bergius) Gaertn.
Eriocephalus
cf. africanus L.
cf. racemosus L.
Gymnodiscus
capillaris (L.f.) DC.
Helichrysum
cf. dasyanthum (Willd.) Sweet
cf. patulum (L.) D.Don.
revolutum (Thunb.) Less.
Metalasia
muricata (L.) D.Don.
Nidorella
cf. foetida (L.) DC.
Othonna
cf. coronopifolia L.
Plecostachys
serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
Pseudognaphalium
undulatum (L.) Hilliard & B.L.Burtt
Senecio
cf. arenarius Thunb.
burchellii DC.
elegans L.
halimifolius L.
cf. hastatus L.
littoreus Thunb.
Seriphium
plumosum L.
Ursinia
anthemoides (L.) Poir. subsp. anthemoides
BORAGINACEAE
Lobostemon
glaucophyllus (Jacq.) H.Buek
BRASSICACEAE
Heliophila
coronopifolia L.
CARYOPHYLLACEAE
Cerastium
capense Sond.
CELASTRACEAE
Putterlickia
pyracantha (L.) Szyszyl.
CRASSULACEAE
Crassula
cymosa P.J.Bergius
glomerata P.J.Bergius
EBENACEAE
Euclea
racemosa Murray
ERICACEAE
Erica
mammosa L.
EUPHORBIACEAE
Clutia
daphnoides Lam.
Euphorbia
ephedroides E.Mey. ex Boiss.
FABACEAE
Aspalathus
ternata (Thunb.) Druce VU
FUMARIACEAE
Cysticapnos
vesicaria (L.) Fedde
GENTIANACEAE
Orphium
frutescens D.Delaroche
GERANIACEAE
Pelargonium
capitatum (L.) L'Hér.
cf. senecioides L'Hér.
LAMIACEAE
Salvia
cf. africana-caerulea L.
lanceolata Lam.
MALVACEAE
Hermannia
pinnata L.
procumbens Cav. subsp. procumbens CR
MENISPERMACEAE
Cissampelos
capensis L.f.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
edulis (L.) L.Bolus
Conicosia
pugioniformis (L.) N.E.Br. subsp. pugioniformis
Dorotheanthus
bellidiformis (Burm.f.) N.E.Br. subsp. bellidiformis LC
Lampranthus
explanatus (L.Bolus) N.E.Br. EN
Ruschia
indecora (L.Bolus) Schwantes EN
misera (L.Bolus) L.Bolus
MOLLUGINACEAE
Adenogramma
cf. glomerata (L.f.) Druce
NEURADACEAE
Grielum
cf. grandiflorum (L.) Druce
OLEACEAE
Olea
exasperata Jacq.
OROBANCHACEAE
Harveya
squamosa (Thunb.) Steud. LC

COMMUNITY K10: SAND PLAIN FYNBOS (contd.)

OXALIDACEAE
Oxalis
luteola Jacq.
obtusa Jacq. LC
polyphylla Jacq.
PLANTAGINACEAE
Plantago
crassifolia Forssk.
PLUMBAGINACEAE
Afrolimon
cf. purpuratum (L.) Lincz. CR
POLYGALACEAE
Nylandtia
spinosa (L.) Dumort.
Polygala
garcinii DC.
POLYGONACEAE
Rumex
cordatus Poir.
lativalvis Meisn.
PROTEACEAE
Leucadendron
levisanus (L.) P.J.Bergius CR
Leucospermum
hypophyllocarpodendron (L.) Druce subsp. canaliculatum (H.Buek.) ex Meisn.) Rourke VU
Serruria
cf. decipiens R.Br. VU
RHAMNACEAE
Phylica
cephalantha Sond.
Trichocephalus
stipularis (L.) Brongn.
ROSACEAE
Cliffortia
falcata L.f.
RUBIACEAE
Anthospermum
prostratum Sond.
spathulatum Spreng. subsp. spathulatum
Galium
tomentosum Thunb.
RUTACEAE
Diosma
aspalathoides Lam. NT
cf. dichotoma P.J.Bergius VU
cf. hirsuta L.
SCROPHULARIACEAE
Diascia
cf. diffusa Benth.
Dischisma
ciliatum (P.J.Bergius) Choisy
Hebenstretia
robusta E.Mey.
Hemimeris
racemosa (Houtt.) Merr. LC
Lyperia
tristis (L.f.) Benth.
Nemesia
affinis Benth.
strumosa (Herb. Banks ex Benth.) Benth. NT
Phyllopodium
heterophyllum (L.f.) Benth. LC
Polycarena
capensis (L.) Benth. NT
SOLANACEAE
Lycium
cf. afrum L.
Solanum
cf. guineense L.
THYMELAEACEAE
Passerina
corymbosa Eckl. ex C.H.Wright
VISCACEAE
Viscum
capense L.f.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Ammocharis
longifolia (L.) M.Roem. LC
Haemanthus
pubescens L.f. subsp. pubescens
ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
ASPARAGACEAE
Asparagus
asparagoides (L.) Druce
capensis L.
lignosus Burm.f.
ASPHODELACEAE
Trachyandra
ciliata (L.f.) Kunth LC
divaricata (Jacq.) Kunth
CYPERACEAE
Cyperus
textilis Thunb.
Ficinia
dunensis Levyns
indica (Lam.) Pfeiffer
nodosa (Rottb.) Goetgh.
secunda (Vahl) Kunth
Isolepis
antarctica (L.) Roem. & Schult.
Scirpoides
thunbergii (Schrad.) Soják
HYACINTHACEAE
Albuca
flaccida Jacq.
Drimia
fragrans (Jacq.) J.C.Manning & Goldblatt
Lachenalia
rubida Jacq.
variegata W.F.Barker
IRIDACEAE
Babiana
tubulosa (Burm.f.) Ker Gawl. VU
Moraea
tripetala (L.f.) Ker Gawl.
Romulea
obscura Klatt
Watsonia
meriana (L.) Mill.
JUNCACEAE
Juncus
kraussii Hochst. subsp. kraussii LC
ORCHIDACEAE
Disa
draconis (L.f.) Sw. EN
Disperis
villosa (L.f.) Sw.
POACEAE
Cynodon
dactylon (L.) Pers.

COMMUNITY K10: SAND PLAIN FYNBOS (contd.)

Ehrharta
calycina Sm.
villosa Schult.f. var. villosa
Stipagrostis
cf. zeyheri (Nees) De Winter

Tribolium
uniolae (L.f.) Renvoize
RESTIONACEAE
Calopsis
viminea (Rottb.) H.P.Linder
Elegia
microcarpa (Kunth) Pillans
Thamnochortus
erectus (Thunb.) Mast.
obtusus Pillans
Willdenowia
incurvata (Thunb.) H.P.Linder
cf. sulcata Mast.

Total named species:	**134**
Total genera:	**100**
Total families:	**50**
Total red data species:	**15**
Total introduced species:	**0**

COMMUNITY K11: BRACK WETLAND IN SOUTH

Division: Anthophyta

Class: Dicotyledones

AMARANTHACEAE
Sarcocornia
pillansii (Moss) A.J.Scott
ASTERACEAE
Chrysanthemoides
incana (Burm.f.) Norl.
Cotula
coronopifolia L.
filifolia Thunb. CR
Nidorella
cf. foetida (L.) DC.
Plecostachys
serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
Senecio
elegans L.
halimifolius L.
littoreus Thunb.
maritimus L.
CRASSULACEAE
Crassula
cf. glomerata P.J.Bergius
natans Thunb. var. natans
thunbergiana Schult. subsp. thunbergiana
FABACEAE
Psoralea
repens L. NT
GENTIANACEAE
Orphium
frutescens D.Delaroche
Sebaea
aurea (L.f.) Sm.
GERANIACEAE
Pelargonium
capitatum (L.) L'Hér.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
PLANTAGINACEAE
Plantago
crassifolia Forssk.
PLUMBAGINACEAE
Limonium
cf. billardieri (Girard) Kuntze
POLYGONACEAE
Rumex
lativalvis Meisn.
SANTALACEAE
Thesium
cf. spicatum L.

Division: Anthophyta
Class: Monocotyledones

ASPHODELACEAE
Trachyandra
divaricata (Jacq.) Kunth
CYPERACEAE
Bolboschoenus
maritimus (L.) Palla
Ficinia
nodosa (Rottb.) Goetgh.
Isolepis
cernua (Vahl) Roem. & Schult.
IRIDACEAE
Romulea
tabularis Eckl. ex Beg.
JUNCAGINACEAE
Triglochin
bulbosa L.
POACEAE
Phragmites
australis (Cav.) Trin. ex Steud.
Sporobolus
virginicus (L.) Kunth
TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species:	**32**
Total genera:	**26**
Total families:	**17**
Total red data species:	**2**
Total introduced species:	**1**

APPENDIX 4.1.2. PLANT SPECIES RECORDED FROM DUYNEFONTEIN – COMPOSITE LIST

NT: Near Threatened; R: Rare, VU: vulnerable EN: Endangered, CR: Critically Endangered

LC: Least Concern; DD: Data Deficient; De: Declining

Report produced by the SaSFLORA database: data (C) Coastec; database design and structures (C) Reuben Roberts

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
- Aizoon
  - paniculatum L.
- Galenia
  - africana L.
  - pubescens (Eckl. & Zeyh.) Druce var. pallens
- Tetragonia
  - decumbens Mill.
  - fruticosa L.
  - spicata L.f.

AMARANTHACEAE
- Bassia
  - diffusa (Thunb.) Kuntze
- Exomis
  - microphylla (Thunb.) Aellen var. axyrioides
- Manochlamys
  - albicans (Aiton) Aellen
- Sarcocornia
  - natalensis (Bunge ex Ung.-Sternb.) A.J.Scott
  - pillansii (Moss) A.J.Scott

ANACARDIACEAE
- Rhus
  - crenata Thunb.
  - glauca Thunb.
  - laevigata L.f.
  - lucida L.

APIACEAE
- Capnophyllum
  - africanum (L.) Gaertn. NT
- Chamarea
  - capensis (Thunb.) Eckl. & Zeyh.
- Dasispermum
  - suffruticosum (P.J.Bergius) B.L.Burtt
- Peucedanum
  - typicum (Eckl. & Zeyh.) B.L.Burtt
- Sonderina
  - caruifolia (Sond.) H.Wolff DD
- Torilis
  - arvensis (Huds.) Link

APOCYNACEAE
- Cynanchum
  - africanum (L.) Hoffmanns.
  - obtusifolium L.f.
- Microloma
  - sagittatum (L.) R.Br.

ASTERACEAE
- Amellus
  - tenuifolius Burm.
- Arctotheca
  - calendula (L.) Levyns
  - populifolia (P.J.Bergius) Norl.
- Arctotis
  - hirsuta (Harv.) Beauv. LC
  - leptorhiza DC.
  - stoechadifolia P.J.Bergius LC
- Chrysanthemoides
  - incana (Burm.f.) Norl.
  - monilifera (L.) Norl. subsp. pisifera (L.) Norl.
- Cineraria
  - geifolia (L.) L.
- Conyza
  - scabrida DC.
- Cotula
  - coronopifolia L.
  - duckittiae (L.Bolus) Bremer & Humphries VU
  - filifolia Thunb. CR
  - turbinata L.
- Dicerothamnus
  - rhinocerotis (DC.) Koekemoer
- Didelta
  - carnosa (L.f.) Aiton var. tomentosa
- Dimorphotheca
  - pluvialis (L.) Moench
- Disparago
  - anomala Schltr. ex Levyns
  - ericoides (P.J.Bergius) Gaertn.
- Eriocephalus
  - africanus L.
  - racemosus L.
- Felicia
  - heterophylla (Cass.) Grau
- Gazania
  - maritima Levyns
  - pectinata (Thunb.) Hartweg
- Gymnodiscus
  - capillaris (L.f.) DC.
- Helichrysum
  - cochleariforme DC. NT
  - crispum (L.) D.Don.
  - dasyanthum (Willd.) Sweet
  - micropoides DC. LC
  - niveum (L.) Less.
  - patulum (L.) D.Don.
  - revolutum (Thunb.) Less.
- Lachnospermum
  - imbricatum (P.J.Bergius) Hilliard
- Metalasia
  - densa (Lam.) Karis
  - muricata (L.) D.Don.
- Nidorella
  - foetida (L.) DC.
- Oncosiphon
  - suffruticosum (L.f.) Kallersjö
- Othonna
  - coronopifolia L.
  - filicaulis Jacq.
- Plecostachys
  - serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
- Pseudognaphalium
  - undulatum (L.) Hilliard & B.L.Burtt
- Senecio
  - arenarius Thunb.
  - burchellii DC.
  - elegans L.
  - glutinosus Thunb.
  - halimifolius L.
  - hastatus L.
  - littoreus Thunb.
  - maritimus L.
  - scapiflorus (L'Her.) C.A.Sm.
- Seriphium
  - cinereum L.
  - plumosum L.
- Steirodiscus
  - tagetes (L.) Schltr. VU
- Trichogyne
  - repens (L.) Anderb.
- Tripteris
  - dentata (Burm.f.) O.Hoffm.
- Ursinia
  - anthemoides (L.) Poir. subsp. anthemoides

BORAGINACEAE
- Amsinckia
  - retrorsa Suksd.
- Lobostemon
  - glaucophyllus (Jacq.) H.Buek

BRASSICACEAE
Heliophila
africana (L.) Marais
coronopifolia L.
linearis (Thunb.) DC. var. linearifolia
refracta Sond.
Lepidium
africanum (Burm.f.) DC.
CAMPANULACEAE
Cyphia
crenata (Thunb.) C.Presl
Lobelia
erinus L. LC
Wahlenbergia
adpressa (Thunb.) Sond.
tenella (L.f.) Lammers
CARYOPHYLLACEAE
Cerastium
capense Sond.
Silene
undulata Aiton
CELASTRACEAE
Gymnosporia
buxifolia (L.) Szyszyl.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Putterlickia
pyracantha (L.) Szyszyl.
CRASSULACEAE
Cotyledon
orbiculata L.
Crassula
cymosa P.J.Bergius
dichotoma L.
glomerata P.J.Bergius
muscosa L.
natans Thunb. var. natans
subulata L.
thunbergiana Schult. subsp. thunbergiana
tomentosa Thunb.
Tylecodon
grandiflorus (Burm.f.) Toelken
paniculatus (L.f.) Toelken
CUCURBITACEAE
Kedrostis
nana (Lam.) Cogn.
EBENACEAE
Euclea
racemosa Murray
ERICACEAE
Erica
mammosa L.
plumosa Thunb. LC
EUPHORBIACEAE
Clutia
daphnoides Lam.
Euphorbia
burmannii E.Mey. ex Boiss.
caput-medusae L. subsp. marlothiana N.E.Br. V
mauritanica L.
FABACEAE
Amphithalea
ericifolia (L.) Eckl. & Zeyh.
Argyrolobium
lunare (L.) Druce
Aspalathus
albens L. VU
divaricata Thunb.
hispida Thunb.
spinescens Thunb subsp. spinescens
ternata (Thunb.) Druce VU
Indigofera
heterophylla Thunb.
meyeriana Eckl. & Zeyh.
procumbens L.
Lebeckia
spinescens Harv.
Lessertia
excisa DC.
frutescens (L.) Goldblatt & J.C.Manning
Otholobium
bracteolatum (Eckl. & Zeyh.) C.H.Stirt.
Psoralea
repens L. NT
FUMARIACEAE
Cysticapnos
vesicaria (L.) Fedde
GENTIANACEAE
Chironia
baccifera L.
Orphium
frutescens D.Delaroche
Sebaea
albens (L.f.) Sm.
aurea (L.f.) Sm.
GERANIACEAE
Pelargonium
capitatum (L.) L'Hér.
gibbosum (L.) L'Hér.
myrrhifolium (L.) L'Hér.
senecioides L'Hér.
triste (L.) L'Hér.
LAMIACEAE
Leonotis
leonurus (L.) R.Br.
Salvia
africana-caerulea L.
africana-lutea L.
lanceolata Lam.
Stachys
aethiopica L.
MALVACEAE
Hermannia
multiflora Jacq.
pinnata L.
procumbens Cav. subsp. procumbens CR
MENISPERMACEAE
Cissampelos
capensis L.f.
MESEMBRYANTHEMACEAE
Amphibolia
laevis (Aiton) H.E.K.Hartmann LC
Carpobrotus
acinaciformis (L.) L.Bolus LC
edulis (L.) L.Bolus
Conicosia
pugioniformis (L.) N.E.Br. subsp. pugioniformis
Dorotheanthus
apetalus (L.f.) N.E.Br. VU
bellidiformis (Burm.f.) N.E.Br. subsp. bellidiformis LC
Jordaaniella
dubia (Haw.) H.E.K.Hartmann LC
Lampranthus
explanatus (L.Bolus) N.E.Br. EN
multiradiatus (Jacq.) N.E.Br.
Mesembryanthemum
canaliculatum Haw.
crystallinum L.
Ruschia
caroli (L.Bolus) Schwantes
indecora (L.Bolus) Schwantes EN
macowanii (L.Bolus) Schwantes
misera (L.Bolus) L.Bolus
MOLLUGINACEAE
Adenogramma
glomerata (L.f.) Druce
Pharnaceum
incanum L.
lanatum Bartl.
microphyllum L.f.

MYRICACEAE
Morella
cordifolia (L.) Killick
quercifolia (L.) Killick
NEURADACEAE
Grielum
grandiflorum (L.) Druce
OLEACEAE
Olea
exasperata Jacq.
ONAGRACEAE
Epilobium
hirsutum L.
OROBANCHACEAE
Harveya
squamosa (Thunb.) Steud. LC
Hyobanche
sanguinea L.
OXALIDACEAE
Oxalis
hirta L.
luteola Jacq.
obtusa Jacq. LC
pes-caprae L.
polyphylla Jacq.
purpurea L.
versicolor L.
PLANTAGINACEAE
Plantago
crassifolia Forssk.
PLUMBAGINACEAE
Afrolimon
perigrinum (P.J.Bergius) Lincz.
purpuratum (L.) Lincz. CR
Limonium
billardieri (Girard) Kuntze
equisetinum (Boiss.) R.A.Dyer
scabrum (Thunb.) Kuntze
POLYGALACEAE
Nylandtia
spinosa (L.) Dumort.
Polygala
garcinii DC.
POLYGONACEAE
Emex
australis Steinh.
Rumex
cordatus Poir.
lativalvis Meisn.
sagittatus Thunb.
PROTEACEAE
Leucadendron
levisanus (L.) P.J.Bergius CR
salignum P.J.Bergius LC
Leucospermum
hypophyllocarpodendron (L.) Druce subsp.
canaliculatum (H.Buek.) ex Meisn.) Rourke VU
Protea
repens (L.) L. LC
Serruria
decipiens R.Br. VU
fasciflora Salisb. ex Knight NT
RHAMNACEAE
Phylica
cephalantha Sond.
ericoides L.
harveyi (Arn.) Pillans VU
plumosa L.
Trichocephalus
stipularis (L.) Brongn.
ROSACEAE
Cliffortia
falcata L.f.
juniperina L.f.
polygonifolia L. var. polygonifolia
RUBIACEAE
Anthospermum
aethiopicum L.
prostratum Sond.
spathulatum Spreng. subsp. spathulatum
Galium
tomentosum Thunb.
RUTACEAE
Agathosma
imbricata (L.) Willd.
serpyllacea Licht. ex Roem. & Schult. LC
Diosma
aspalathoides Lam. NT
dichotoma P.J.Bergius VU
hirsuta L.
oppositifolia L.
SANTALACEAE
Osyris
compressa (P.J.Bergius) A.DC.
Thesidium
fragile (Thunb.) Sond.
Thesium
aggregatum A.W.Hill
frisea L.
pubescens DC.
scabrum L.
spicatum L.
strictum P.J. Bergius
virgatum Lam.
SCROPHULARIACEAE
Diascia
diffusa Benth.
Dischisma
ciliatum (P.J.Bergius) Choisy subsp. ciliatum
Hebenstretia
dentata L.
repens Jaroscz
robusta E.Mey.
Hemimeris
racemosa (Houtt.) Merr. LC
sabulosa L.f.
Lyperia
lychnidea (L.) Druce
tristis (L.f.) Benth.
Manulea
rubra L.f. LC
thyrsiflora L.f.
tomentosa (L.) L.
Nemesia
affinis Benth.
bicornis (L.) Pers.
strumosa (Herb. Banks ex Benth.) Benth. NT
Oftia
africana (L.) Bocq.
Phyllopodium
cephalophorum (Thunb.) Hilliard
heterophyllum (L.f.) Benth. LC
phyllopodioides (Schltr.) Hilliard
Polycarena
capensis (L.) Benth. NT
Zaluzianskya
villosa F.W.Schmidt
SOLANACEAE
Lycium
afrum L.
ferocissimum Miers
Solanum
africanum Mill. LC
guineense L.
nigrum L.
THYMELAEACEAE
Lachnaea
grandiflora (L.f.) Baill. VU
uniflora (L.) Beyers VU

Passerina
corymbosa Eckl. ex C.H.Wright
ericoides L. VU
paleacea Wikstr.
rigida Wikstr.
Struthiola
leptantha Bolus
URTICACEAE
Didymodoxa
capensis (L.f.) Friis & Wilmot-Deare
VISCACEAE
Viscum
capense L.f.
ZYGOPHYLLACEAE
Roepera
flexuosum Eckl. & Zeyh.
fulva L.
morgsana L.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Ammocharis
longifolia (L.) M.Roem. LC
Brunsvigia
orientalis (L.) Aiton ex Eckl.
Crossyne
guttata (L.) D. & U.Mull.-Doblies
Gethyllis
ciliaris (Thunb.) Thunb.
Haemanthus
coccineus L.
pubescens L.f. subsp. pubescens
ANTHERICACEAE
Chlorophytum
triflorum (Aiton) Kunth
APONOGETONACEAE
Aponogeton
angustifolius Aiton VU
ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
ASPARAGACEAE
Asparagus
aethiopicus L.
asparagoides (L.) Druce
capensis L.
declinatus L.
lignosus Burm.f.
rubicundus P.J.Bergius
ASPHODELACEAE
Bulbine
annua (L.) Willd.
Trachyandra
ciliata (L.f.) Kunth LC
divaricata (Jacq.) Kunth
falcata (L.f.) Kunth
muricata (L.f.) Kunth
revoluta (L.) Kunth
sabulosa (Adamson) Oberm.
COLCHICACEAE
Ornithoglossum
viride (L.f.) Aiton
CYPERACEAE
Bolboschoenus
maritimus (L.) Palla
Cyperus
textilis Thunb.
Ficinia
argyropa Nees
bulbosa (L.) Nees
capitella (Thunb.) Nees
dunensis Levyns
indica (Lam.) Pfeiffer
lateralis (Vahl) Kunth
nodosa (Rottb.) Goetgh.
oligantha (Steud.) J.Raynal
pygmaea Boeck. NT
secunda (Vahl) Kunth
Hellmuthia
membranacea (Thunb.) R.Haynes & K.Lye
Isolepis
antarctica (L.) Roem. & Schult.
cernua (Vahl) Roem. & Schult.
marginata (Thunb.) A.Dietr.
rubicunda Kunth
venustula Kunth VU
Scirpoides
thunbergii (Schrad.) Soják
HAEMODORACEAE
Wachendorfia
multiflora (Klatt) J.C. Manning and Goldblatt
paniculata Burm.
HEMEROCALLIDACEAE
Caesia
contorta (L.f.) T.Durand & Schinz
HYACINTHACEAE
Albuca
flaccida Jacq.
maxima Burm.f.
Drimia
fragrans (Jacq.) J.C.Manning & Goldblatt
Lachenalia
bulbifera (Cyrillo) Engl.
rubida Jacq.
variegata W.F.Barker
IRIDACEAE
Aristea
africana (L.) Hoffmanns.
dichotoma (Thunb.) Ker-Gawl.
Babiana
ringens (L.) Ker Gawl.
tubulosa (Burm.f.) Ker Gawl. var. tubulosa VU
Ferraria
crispa Burm. subsp. crispa LC
Gladiolus
carinatus Aiton
cunonius (L.) Gaertn.
Lapeirousia
anceps (L.f.) Ker Gawl.
Melasphaerula
ramosa (L.) N.E.Br.
Moraea
fugax (D.Delaroche) Jacq.
tripetala (L.f.) Ker Gawl.
Romulea
obscura Klatt
rosea (L.) Eckl.
tabularis Eckl. ex Beg.
Watsonia
meriana (L.) Mill.
JUNCACEAE
Juncus
kraussii Hochst. subsp. kraussii LC
JUNCAGINACEAE
Triglochin
bulbosa L.
ORCHIDACEAE
Corycium
crispum (Thunb.) Sw.
orobanchoides (L.f.) Sw. LC
Disa
draconis (L.f.) Sw. EN

Disperis
villosa (L.f.) Sw.
Satyrium
carneum (Dryand.) Sims NT
POACEAE
Aristida
junciformis Trin. & Rupr.
Cladoraphis
cyperoides (Thunb.) S.M.Phillips
Cynodon
dactylon (L.) Pers.

Ehrharta
brevifolia Schrad. var. brevifolia
calycina Sm.
delicatula (Nees) Stapf
erecta Lam.
longiflora J.E.Sm.
villosa Schult.f. var. villosa
Imperata
cylindrica (L.) Raeuschel
Pentaschistis
barbata (Nees) H.P.Linder subsp. barbata
pallida (Thunb.) H.P.Linder LC
Phragmites
australis (Cav.) Trin. ex Steud.
Sporobolus
virginicus (L.) Kunth
Stipagrostis
zeyheri (Nees) De Winter
Tribolium
hispidum (Thunb.) Desv.
uniolae (L.f.) Renvoize
RESTIONACEAE
Calopsis
fruticosa (Mast.) H.P.Linder
viminea (Rottb.) H.P.Linder
Elegia
coleura Nees ex Mast.
microcarpa (Kunth) Pillans
nuda (Rottb.) Kunth
recta (Mast.) Moline & H P Linder NT
tectorum (L.f.) Raf.
Ischyrolepis
capensis (L.) H.P.Linder
eleocharis (Nees ex Mast.) H.P.Linder
Thamnochortus
erectus (Thunb.) Mast.
obtusus Pillans
punctatus Pillans De
spicigerus (Thunb.) Spreng.
Willdenowia
arescens Kunth
incurvata (Thunb.) H.P.Linder
sulcata Mast.
teres Thunb.
TECOPHILAEACEAE
Cyanella
hyacinthoides L.
TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species: 408
Total genera: 215
Total families: 66
Total red data species: 37
Total introduced species: 13

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
AIZOACEAE	Aizoon paniculatum L.	pienkspekvygie	Bokkeveld Mts to Cape Peninsula	No change; coastal sands						
AIZOACEAE	Galenia africana L.	geelbos, geelbrakbos, kraalbos, muisbos, waterpensbos	Namaqualand to Uniondale, Karoo and E Cape	No change, dry flats and lower slopes, often on disturbed ground						
AIZOACEAE	Tetragonia decumbens Mill.	kinkelbossie	S Namibia to E Cape	No change; coastal dunes						
AIZOACEAE	Tetragonia fruticosa L.	kinkelbossie, kinkelklappers, kleinsaadklaapiesbr ak, klimopkinkelbossie, porslein, slaaibos	Namaqualand to Clanwilliam to Port Elizabeth	Southern extension of distribution, granite and sandstone slopes especially along the coast						1
AIZOACEAE	Tetragonia spicata L.f.		Namaqualand and Karoo to Grahamstown	Southern extension of distribution, granite and sandy slopes						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
AMARANTHACEAE	Bassia diffusa (Thunb.) Kuntze	soutbossie	KZN, NC, WC, EC	No change						
AMARANTHACEAE	Exomis microphylla (Thunb.) Aellen var. axyrioides	brakbossie, hondebossie	Southern Namibia to Uitenhage	No change; stony hillsides, often coastal sands						
AMARANTHACEAE	Manochlamys albicans (Aiton) Aellen	hondebossie, spanspekbos	S Namibia and W Karoo to Cape Peninsula and Little Karoo	No change, dry stony slopes and flats						
AMARANTHACEAE	Sarcocornia natalensis (Bunge ex Ung.-Sternb.) A.J.Scott	seekoraal	Angola to Mozambique, Madagascar	No change; coastal and inland saline habitats						
AMARANTHACEAE	Sarcocornia pillansii (Moss) A.J.Scott	brakbos, kleinlidjiesbos	S Namibia to Mozambique	No change; inland and coastal saline marshes						
ANACARDIACEAE	Rhus crenata Thunb.	(dune) crow-berry, duinekraaibessie, rosyntjiebos	Cape Peninsula to S KwaZulu-Natal	Northern extension of distribution, sandy coastal flats						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ANACARDIACEAE	Rhus glauca Thunb.	bloukoeniebos, blue kuni-bush, taaiblaar	Velddrif to Kentani	No change, mostly on dunes						
ANACARDIACEAE	Rhus laevigata L.f.	duinetaaibos, dune taaibos, koerentebos, ranktaaibos, taaibos, umhlakothi	Lamberts Bay to East London	No change, coastal flats and slopes						
ANACARDIACEAE	Rhus lucida L.	besembos, blinktaaibos, wild currant	Citrusdal to Zimbabwe	No change, sandy flats and slopes						
APIACEAE	Capnophyllum africanum (L.) Gaertn.		Saldanha to Gansbaai	No change; sand dunes						
APIACEAE	Chamarea capensis (Thunb.) Eckl. & Zeyh.	Cape caraway, finkelwortel	Cape Peninsula to Karoo and E Cape	No change, sandstone slopes						
APIACEAE	Dasispermum suffruticosum (P.J.Bergius) B.L.Burtt	duineseldery	S Namaqualand to KwaZulu-Natal	No change, **coastal dunes endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
APIACEAE	Peucedanum typicum (Eckl. & Zeyh.) B.L.Burtt	hondewortel	Uitenhage	Major range extension to West Coast; coastal scrub in sands, **local endemic**				1		1
APIACEAE	Sonderina caruifolia (Sond.) H.Wolff		Lambert's Bay to Cape Peninsula	No change; **West Coast endemic**; restricted to sandy flats		1				
APIACEAE	Torilis arvensis (Huds.) Link	hedge parsley, wildewortel	Bokkeveld Mts to Cape Peninsula, W Karoo and E Cape to Europe	No change, flats and rocky slopes						
APOCYNACEAE	Cynanchum africanum (L.) Hoffmanns.	bobbejaantou, bokhoring, klimop, monkey rope	Namaqualand to Cape Peninsula to Eastern Cape	No change, sandy, coastal soils						
APOCYNACEAE	Cynanchum obtusifolium L.f.	melktou, monkey rope	Cape Peninsula to Mozambique	No change, coastal bush						
APOCYNACEAE	Microloma sagittatum (L.) R.Br.	bokhoring, bokmaellie, heuningblommetjie	Namaqualand to Willowmore	Southern extension of distribution, stony slopes to sandy flats						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Amellus tenuifolius Burm.	grysastertjie	S Namibia to Villiersdorp	South western range extension, sandy flats near coast						1
ASTERACEAE	Arctotheca calendula (L.) Levyns	Cape weed, gousblom	Namaqualand and Karoo to Cape Peninsula and Humansdorp	No change, coastal areas or disturbed soil						
ASTERACEAE	Arctotheca populifolia (P.J.Bergius) Norl.	sea pumpkin, seepampoen	Saldanha to Mozambique	No change; **Coastal dunes endemic**					1	
ASTERACEAE	Arctotis hirsuta (Harv.) Beauv.	gousblom	Elandsbaai to Potberg	No change, sandy slopes and flats, usually coastal, **Cape endemic**					1	
ASTERACEAE	Arctotis leptorhiza DC.		Nardouwsberg to Mamre	No change, rocky sandstone slopes, endemic					1	
ASTERACEAE	Arctotis stoechadifolia P.J.Bergius	kusgousblom, witgousblom	Yzerfontein to Cape Peninsula	No change, **endemic to SW coastal flats**		1				

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Chrysanthemoides incana (Burm.f.) Norl.	bietou, grysbietou, sandbietou	Namibia and Karoo to Bredasdorp	No change, coastal dunes or sandy inland slopes						
ASTERACEAE	Chrysanthemoides monilifera (L.) Norl. subsp. pisifera (L.) Norl.	bietou, boetabessie, bosluisbessie, brother berry	Namaqualand to tropical Africa	Southern extension of distribution, sandstone and limestone slopes and flats						1
ASTERACEAE	Cineraria geifolia (L.) L.		Cape Peninsula to S KwaZulu-Natal	No change, coastal bush						
ASTERACEAE	Conyza scabrida DC.	bakbesembossie, oondbos, ovenbush	Clanwilliam to Zimbabwe	Southern range extension, normally occurs on sandstone slopes or forest margins, often near streams						1
ASTERACEAE	Cotula coronopifolia L.	eendekos, eendjiesgras, eendjieskweek, gansgras, gansogies	Namaqualand to Mpumalanga, Australia	No change, seasonally wet areas and coastal sands and clays						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Cotula duckittiae (L.Bolus) Bremer & Humphries	buttons, ganskos	Yzerfontein to Bokbaai	No change; sandy coastal slopes, **south west coastal endemic**				1		
ASTERACEAE	Cotula filifolia Thunb.		Darling to Agulhas	No change, **coastal endemic,** on marshy ground					1	
ASTERACEAE	Cotula turbinata L.	batchelor buttons, ganskos	N Cedarberg Mts to Potberg	No change, sandy or disturbed areas, **Cape endemic**					1	
ASTERACEAE	Dicerothamnus rhinocerotis (DC.) Koekemoer	renosterbos		No change, dry shale and sandstone slopes and flats						
ASTERACEAE	Didelta carnosa (L.f.) Aiton var. tomentosa	kusslaaibos, perdeblom, seegousblom	S Namibia to Cape Peninsula	No change, coastal dunes and sandy flats						
ASTERACEAE	Dimorphotheca pluvialis (L.) Moench	Cape (rain) daisy, ox-eye daisy, reënblommetjie, witbotterblom	S Namibia to Gouritsmond	No change, sandy and clay flats and slopes						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Disparago anomala Schltr. ex Levyns		Cape Peninsula to Potberg	No change; **Coastal dunes and limestone endemic**					1	
ASTERACEAE	Disparago ericoides (P.J.Bergius) Gaertn.		Darling to Matroosberg and Gouritsmond	No change, **Cape endemic**, sandstone slopes					1	
ASTERACEAE	Eriocephalus africanus L.	kapokbossie, roosmaryn, wild rosemary, wilderoosmaryn	S Namaqualand to Port Elizabeth and E Cape	South western extension of distribution, clay or granite hillsides						1
ASTERACEAE	Eriocephalus racemosus L.	kapkoppie, kapokbos, roosmaryn, wilderoosmaryn	S Namaqualand to Humansdorp	No change, coastal dunes and hills						
ASTERACEAE	Felicia heterophylla (Cass.) Grau	bloublomastertjie	Clanwilliam to Cape Peninsula	No change, sandy flats and slopes**,** Cape endemic						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Gazania maritima Levyns		Elandsbaai to Cape Hangklip	No change, coastal sands and rock, **coastal endemic**					1	
ASTERACEAE	Gazania pectinata (Thunb.) Hartweg	Kaapserooigousblom	Saldanha to Potberg	No change, **coastal flats endemic**					1	
ASTERACEAE	Gymnodiscus capillaris (L.f.) DC.	geelkruid	Namaqualand to Mossel Bay and W Karoo	Southern extension of distribution, sandy flats and lower slopes						1
ASTERACEAE	Helichrysum cochleariforme DC.	duineteebossie, gold-and-silver	Aurora to Gouriqua	No change, **coastal dunes endemic**					1	
ASTERACEAE	Helichrysum crispum (L.) D.Don.	Hottentotskooigoed, kooigoed	Bloubergstrand to George	No change, **coastal dunes endemic**					1	
ASTERACEAE	Helichrysum dasyanthum (Willd.) Sweet	kooigoed	Namaqualand to Baviaanskloof Mts	South western extension of distribution, sandy flats and slopes						1
ASTERACEAE	Helichrysum micropoides DC.		S Namibia and W Karoo to Ceres	Major southern range extension, sandy flats						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Helichrysum niveum (L.) Less.		Saldanha to Stilbaai	No change, **coastal dunes endemic**					1	
ASTERACEAE	Helichrysum patulum (L.) D.Don.	Hottentot's bedding, Hottentotskooigoe d, kooigoed	Cape Peninsula to Mossel Bay	No change, sandy flats and slopes, **coastal endemic**					1	
ASTERACEAE	Helichrysum revolutum (Thunb.) Less.	kooigoed, strandsewejaartjie, vaalsewejaartjie	S Namibia to Cape Peninsula and Witteberg	No change, rocky or sandy flats and slopes						
ASTERACEAE	Lachnospermum imbricatum (P.J.Bergius) Hilliard		Mamre to Cape Flats and Elim to Agulhas	No change, **coastal dune and limestone endemic**				1		
ASTERACEAE	Metalasia densa (Lam.) Karis	blombos	Namaqualand to N Province	Southern extension of distribution, sandy or stony flats or slopes						1
ASTERACEAE	Metalasia muricata (L.) D.Don.	blombos, steekbos, witsteekbossie	Yzerfontein to Transkei	No change, coastal sands						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Nidorella foetida (L.) DC.	vleikruid	Lambert's Bay to E Cape	No change, damp sites, often seeps and marshes						
ASTERACEAE	Oncosiphon suffruticosum (L.f.) Kallersjö	stinkkruid, stinkkruidbossie, wurmbossie	S Namibia and W Karoo to Gansbaai	No change, sandy flats and slopes, often coastal						
ASTERACEAE	Othonna coronopifolia L.	sandbobbejaankool	Pakhuis Mts to Cape Peninsula	No change, rocky sandstone and granite slopes especially along the coast, **Cape endemic**					1	
ASTERACEAE	Othonna filicaulis Jacq.	bobbejaankoolklimop	S Namibia to Uniondale	No change, sandy flats and slopes, often coastal						
ASTERACEAE	Plecostachys serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt	vaaltee	Langebaan to KwaZulu-Natal	No change, sandy coastal flats or damp slopes, often coastal						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Pseudognaphalium undulatum (L.) Hilliard & B.L.Burtt		Namibia to Port Elizabeth and S Mozambique	Southern range extension, damp, grassy or rocky slopes						1
ASTERACEAE	Senecio arenarius Thunb.	hongerblom	S Namibia and W Karoo to De Hoop	No change, **sandy flats endemic**					1	
ASTERACEAE	Senecio burchellii DC.	geelgifbos, Molteno disease plant	Namibia to Cape Peninsula to Port Elizabeth	No change, sandy and stony slopes						
ASTERACEAE	Senecio elegans L.	strandblommetjie, veld cineraria, wild cineraria	Saldanha to Port Elizabeth	No change, **coastal dune endemic**					1	
ASTERACEAE	Senecio glutinosus Thunb.	taaigeelhongerblo m	S Namibia to Piketberg and Montagu	Major southern range extension, sandstone slopes						1
ASTERACEAE	Senecio halimifolius L.	tabakbos	Lambert's Bay to Hermanus	No change, **coastal dune endemic**					1	
ASTERACEAE	Senecio hastatus L.	groundsel	Ceres to KwaZulu-Natal and Karoo	No change, rocky karroid slopes						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Senecio littoreus Thunb.	geelhongerblom, hongerblom	Namaqualand: Koekenaap to Cape Peninsula and Napier	No change, **coastal sands endemic**					1	
ASTERACEAE	Senecio maritimus L.	strandhongerblom	S Namaqualand to Agulhas	No change, coastal dunes and slopes						
ASTERACEAE	Senecio scapiflorus (L'Her.) C.A.Sm.	perskoppie	Namaqualand to Cape Peninsula	No change, rocky slopes and flats						
ASTERACEAE	Seriphium cinereum L.	vaalhartebeeskaroo, vaalrenosterbos	Cape Peninsula to Riviersonderend Mts	No change, slopes, often shale, **Cape endemic**					1	
ASTERACEAE	Seriphium plumosum L.	"khoi"-kooigoed, slangbos	Throughout southern Africa	No change, rocky flats and slopes						
ASTERACEAE	Steirodiscus tagetes (L.) Schltr.	cabaroe	Hopefield to Cape Peninsula	No change, **Sandy flats endemic**		1				
ASTERACEAE	Trichogyne repens (L.) Anderb.	witnaaldebossie	Vredenburg to Mossel Bay	No change, **coastal dunes and sandy flats endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASTERACEAE	Tripteris dentata (Burm.f.) O.Hoffm.	jakkalsgousblom	Redelinghuys to Cape Peninsula	No change, sandstone slopes and flats, **Cape endemic**					1	
ASTERACEAE	Ursinia anthemoides (L.) Poir. subsp. anthemoides	bergmargriet, margriet, marigold	S Namibia and Karoo to Port Elizabeth	No change, sandy and gravel slopes						
BORAGINACEAE	Amsinckia retrorsa Suksd.	ystergras	American weed	No change						
BORAGINACEAE	Lobostemon glaucophyllus (Jacq.) H.Buek	blosblaarluibos	Clanwilliam to Cape Peninsula, Worcester to Swartberg Mts	No change, sandy flats and slopes, **endemic**					1	
BRASSICACEAE	Heliophila africana (L.) Marais	bloubekkie, sandflaks	Namaqualand to Swellendam	Southern extension of distribution, sandy flats						1
BRASSICACEAE	Heliophila coronopifolia L.	blouflaks, wild flax	S Namaqualand to Caledon	No change, flats and slopes						
BRASSICACEAE	Heliophila linearis (Thunb.) DC. var. linearifolia		Langebaan to E Cape	No change, sandy coastal flats						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
BRASSICACEAE	Heliophila refracta Sond.	draadblaarflaks	Elandsbaai to Stilbaai	No change, **coastal endemic**					1	
BRASSICACEAE	Lepidium africanum (Burm.f.) DC.	bird-seed, peperbossie, pepper weed	Widespread indigenous weed	No change						
CAMPANULACEAE	Cyphia crenata (Thunb.) C.Presl	kleinbokkies	Namaqualand to Cape Peninsula	No change, sandy flats, often coastal						
CAMPANULACEAE	Lobelia erinus L.	wild lobelia	Bokkeveld Mts to tropical Africa	Southern extension of distribution, lower mountain slopes and coastal flats						1
CAMPANULACEAE	Wahlenbergia adpressa (Thunb.) Sond.		Rocher Pan to Cape Peninsula	No change, **coastal endemic**					1	
CAMPANULACEAE	Wahlenbergia tenella (L.f.) Lammers		Mamre to E Cape	No change, sandy flats and slopes, often coastal						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
CARYOPHYLLACEAE	Cerastium capense Sond.	horingblom	widespread in southern Africa	No change, sheltered flats and slopes and waste places						
CARYOPHYLLACEAE	Silene undulata Aiton	wild tobacco, wildetabak	southern and tropical Africa	No change, slopes and flats						
CELASTRACEAE	Gymnosporia buxifolia (L.) Szyszyl.	gewonependoring, mnquqoba, stinkpendoring	widespread in southern and tropical Africa	No change, forest margins and disturbed areas						
CELASTRACEAE	Pterocelastrus tricuspidatus (Lam.) Sond.	cherrywood, kershout, utwina	Velddrif to Cape Peninsula to Port Edward	No change, dune scrub or forest						
CELASTRACEAE	Putterlickia pyracantha (L.) Szyszyl.	basterpendoring, pendoring, wildegranaat	Velddrif to E Cape	No change, coastal scrub						
CRASSULACEAE	Cotyledon orbiculata L.	honde-oor, kouterie, pig's ear, plakkie(s), varkoor	Namibia and South Africa	No change, sandy or stony soils in scrub						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
CRASSULACEAE	Crassula cymosa P.J.Bergius		S Namaqualand to Riviersonderend Mountains	Southern extension of distribution, sandy or gravelly slopes						1
CRASSULACEAE	Crassula dichotoma L.	geel crassula	Namaqualand to Agulhas	No change, sandy flats						
CRASSULACEAE	Crassula glomerata P.J.Bergius	brakvygie	Clanwilliam to Port Elizabeth	No change, **coastal flats and limestone endemic**					1	
CRASSULACEAE	Crassula muscosa L.	akkedisstert, lizard's tail, skilpadbos, skoenveterbossie, veterbos	S Namibia to E Cape and Free State	Southern extension of distribution, rocky flats and slopes						1
CRASSULACEAE	Crassula natans Thunb. var. natans	watergras	Widespread in South Africa and Lesotho	No change, moist depressions or pools						
CRASSULACEAE	Crassula subulata L.		Bokkeveld mountains to Port Alfred	No change, dry rocky slopes						
CRASSULACEAE	Crassula thunbergiana Schult. subsp.		S Namibia to Agulhas	No change, sandy flats and slopes, often						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
	thunbergiana			coastal						
CRASSULACEAE	Crassula tomentosa Thunb.		S Namibia to Gourits River	No change, stony slopes						
CRASSULACEAE	Tylecodon grandiflorus (Burm.f.) Toelken	rooisuikerblom	S Namaqualand to Cape Peninsula	No change, rocky outcrops, often granite						
CRASSULACEAE	Tylecodon paniculatus (L.f.) Toelken	botterboom	Namibia to Cape Peninsula through Little Karoo to Willowmore	No change, rocky slopes						
CUCURBITACEAE	Kedrostis nana (Lam.) Cogn.	bryony, ystervarkpatat(s)	Saldanha to KwaZulu-Natal	No change, coastal scrub						
EBENACEAE	Euclea racemosa Murray	bosghwarrie, bush guarri, kersbos, sea guarri, seeghwarrie	Namaqualand to E Cape	No change, coastal scrub						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ERICACEAE	Erica mammosa L.	ninepin heath, rooiklossieheide, spinnekopvoete	Cedarberg Mts to Bredasdorp	South western extension of distribution, sandy flats and lower mountain slopes, **Cape endemic**					1	1
ERICACEAE	Erica plumosa Thunb.	silwerbasterheide, wolheide	Bokkeveld to Langeberg Mts	Southern range extension, sandy flats and lowers lopes, **Cape endemic**					1	1
EUPHORBIACEAE	Clutia daphnoides Lam.	vaalblaar, vaalbliksembos, vaalbossie	Saldanha to E Cape	No change, coastal bush						
EUPHORBIACEAE	Euphorbia burmannii E.Mey. ex Boiss.	lidjiesmelkbos, Sandveld-se-soetmelkbos, soetmelkbos, steenbokbos, steenbokmelkbos	Namaqualand to E Cape	No change, sandy to stony flats and slopes						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
EUPHORBIACEAE	Euphorbia caput-medusae L. subsp. marlothiana N.E.Br.	medusa's head, noordpol, vingerpol	Namaqualand to Mossel Bay	No change, sandy flats and stony slopes						
EUPHORBIACEAE	Euphorbia mauritanica L.	beesmelkbos, geelmelkbos	widespread in southern Africa	No change, flats and stony slopes						
FABACEAE	Amphithalea ericifolia (L.) Eckl. & Zeyh.	persblom, persbossie	Malmesbury to Albertinia	South western extension of distribution, **lowland fynbos endemic**					1	1
FABACEAE	Argyrolobium lunare (L.) Druce		Clanwilliam to Caledon	South western extension of distribution, **lowland fynbos endemic**					1	1
FABACEAE	Aspalathus albens L.	duine-ertjiebos	Namaqualand: near Hondeklipbaai to Cape Peninsula	No change, **lowland and coastal endemic**					1	
FABACEAE	Aspalathus divaricata Thunb.		Gifberg to Riviersonderend Mts	Southern range extension, **mountain fynbos endemic**					1	1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
FABACEAE	Aspalathus hispida Thunb.	witertjiebos	Namaqualand near Springbok, Gifberg to Alexandria	Southern extension of distribution, coastal fynbos						1
FABACEAE	Aspalathus spinescens Thunb subsp. spinescens	wolfdoring	Vredendal to Mamre	Slight south western extension of distribution, **coastal fynbos endemic**					1	1
FABACEAE	Aspalathus ternata (Thunb.) Druce	bolblomertjiebos	Lambert's Bay to Cape Peninsula	No change, **coastal dune endemic**					1	
FABACEAE	Indigofera heterophylla Thunb.		Namaqualand and Karoo to E Cape	No change, renosterveld and fynbos						
FABACEAE	Indigofera meyeriana Eckl. & Zeyh.	silwerlewerertijie	Namaqualand and Karoo to E Cape	No change, karroid scrub, renosterveld, strandveld						
FABACEAE	Indigofera procumbens L.		Lambert's Bay to Cape Flats	No change, **renosterveld, coastal fynbos, strandveld endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
	Lebeckia spinescens Harv.	sandganna	Namibia and Karoo to Clanwilliam	Major southern range extension, karroid scrub						1
FABACEAE	Lessertia excisa DC.		Namaqualand to Cape Peninsula	No change, sandstone slopes and flats						
FABACEAE	Lessertia frutescens (L.) Goldblatt & J.C.Manning	cancer bush, kankerbos	Namaqualand and W Karoo to E Cape	No change, sandstone and shale flats and slopes						
FABACEAE	Otholobium bracteolatum (Eckl. & Zeyh.) C.H.Stirt.	skaapbostee	Saldanha to Grahamstown	No change, **sandveld and limestone endemic**					1	
FABACEAE	Psoralea repens L.		Cape Peninsula to E Cape	No change, coastal fynbos						
FUMARIACEAE	Cysticapnos vesicaria (L.) Fedde	klappertjie	Namaqualand to De Hoop	No change, **sandy flats and slopes, endemic**					1	
GENTIANACEAE	Chironia baccifera L.	bitterbessiebos, perdebossie	Namaqualand to KwaZulu-Natal	Southern extension of distribution, sandy flats and slopes						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
GENTIANACEAE	Orphium frutescens D.Delaroche	teeringbos	Lambert's Bay to George	No change, **coastal endemic**					1	
GENTIANACEAE	Sebaea albens (L.f.) Sm.	kleinwitnaeltjiesblom	Piketberg to Albertinia	No change, **coastal flats endemic**					1	
GENTIANACEAE	Sebaea aurea (L.f.) Sm.	kleingeelnaeltjiesblom	Pakhuis Mts to Cape Peninsula to Humansdorp	No change, sandy flats and slopes, **Cape endemic**					1	
GERANIACEAE	Pelargonium capitatum (L.) L'Hér.	kusmalva, rose-scented pelargonium	Lambert's Bay to KwaZulu-Natal	No change, coastal dunes and flats						
GERANIACEAE	Pelargonium gibbosum (L.) L'Hér.	dikbeenmalva	Namaqualand to Cape Peninsula	No change, rock outcrops near coast						
GERANIACEAE	Pelargonium myrrhifolium (L.) L'Hér.	fynblaarmalva, wildemalva	Kamiesberg to Uitenhage	Southern extension of distribution, stony sand						1
GERANIACEAE	Pelargonium senecioides L'Hér.	teermalva	Namaqualand to Cape Peninsula and Witteberg	No change, **deep sand endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
GERANIACEAE	Pelargonium triste (L.) L'Hér.	basbossie, kaneelbol, kaneeltjie, landwortel, naelblom, nagblom, rasmusbas, rooiwortel	Namaqualand to Albertinia	No change, sandy flats and slopes						
LAMIACEAE	Leonotis leonurus (L.) R.Br.	duiwelstabak, klipdagga, rivierdagga, rooidagga, wildedagga	Clanwilliam to Gauteng	Southern extension of distribution, forest margins or rough grassland						
LAMIACEAE	Salvia africana-caerulea L.	bloublomsalie	Namaqualand to Cape Peninsula to Montagu	No change, sandy flats and slopes, **Cape endemic**					1	
LAMIACEAE	Salvia africana-lutea L.	bruinsalie, sandsalie, strandsalie, wild sage	Namaqualand to E Cape	No change, coastal dunes and slopes						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
LAMIACEAE	Salvia lanceolata Lam.	rooisalie	Namaqualand to Cape Peninsula and Montagu	No change, coastal sands and rocky outcrops						
LAMIACEAE	Stachys aethiopica L.	katbossie, kleinkattekruie	Bokkeveld Mts to Swaziland	Southern range extension, scrub or grassland						1
MALVACEAE	Hermannia multiflora Jacq.		Bokkeveld Mts to Cape Peninsula	No change, sandy and rocky flats and slopes, **Cape endemic**					1	
MALVACEAE	Hermannia pinnata L.	kwasblaarkruippoproos	Velddrif to Cape Peninsula	No change, **coastal dune endemic**					1	
MALVACEAE	Hermannia procumbens Cav. subsp. procumbens	poproos	Bokbaai to Cape Peninsula	No change, **coastal dune endemic**		1				
MENISPERMACEAE	Cissampelos capensis L.f.	davidjies, fynblaarklimop	S Namibia and W Karoo to Port Elizabeth	Southern extension of distribution, sandy slopes in scrub						1
MESEMBRYANTHEMACEAE	Amphibolia laevis	kusduinevygie	Vredendal to	No change, coastal					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
	(Aiton) H.E.K.Hartmann		Melkbosstrand	plains, endemic						
MESEMBRYANTHEMACEAE	Carpobrotus acinaciformis (L.) L.Bolus	elandsvy, Hottentot fig, sour fig, suurvy	Saldanha to Mossel Bay	No change, **coastal dune endemic**					1	
MESEMBRYANTHEMACEAE	Carpobrotus edulis (L.) L.Bolus	"Khoi"-vy, gaukum, Hotnotsvy, Hottentot fig, Hottentotsvy, klipbokvy, perdevy, sour fig, suurvy	Namaqualand to E Cape	No change, coastal and inland slopes						
MESEMBRYANTHEMACEAE	Conicosia pugioniformis (L.) N.E.Br. subsp. pugioniformis	gansies, grootvetkousie, snotwortel, varkslaai, volstruisvygie	Richtersveld to Port Elizabeth	No change, coastal flats						
MESEMBRYANTHEMACEAE	Dorotheanthus apetalus (L.f.) N.E.Br.		Yzerfontein to Cape Agulhas	No change, **coastal flats endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
MESEMBRYANTHEMACEAE	Dorotheanthus bellidiformis (Burm.f.) N.E.Br. subsp. bellidiformis	Bokbaaivygie, Livinstone daisy, sandvygie, ysplant	Namaqualand to Stilbaai	No change, sandy flats						
MESEMBRYANTHEMACEAE	Jordaaniella dubia (Haw.) H.E.K.Hartmann	helderkruipvygie	Elandsbaai to Mossel Bay	No change, **coastal dune endemic**					1	
MESEMBRYANTHEMACEAE	Lampranthus explanatus (L.Bolus) N.E.Br.	geelsandvygie	Cape Flats to Cape Agulhas	No change, sandy flats, **southern coast and flats endemic**					1	
MESEMBRYANTHEMACEAE	Lampranthus multiradiatus (Jacq.) N.E.Br.	heldersandvygie	Cape Peninsula	No change, stony slopes, **endemic**				1		
MESEMBRYANTHEMACEAE	Mesembryanthemum canaliculatum Haw.	kruipvygie	Cape Peninsula to Port Elizabeth	Northern extension of distribution, coastal dune endemic					1	1
MESEMBRYANTHEMACEAE	Mesembryanthemum crystallinum L.	brakslaai, ice plant, lizard plant, slaaibos	Lambert's Bay to E Cape	No change, coastal sands						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
MESEMBRYANTHEMACEAE	Ruschia caroli (L.Bolus) Schwantes	beesvygie	Clanwilliam to Montagu and Robertson	Southern extension of distribution, habitat?, **Cape endemic - COASTAL PLUS KAROO**					1	1
MESEMBRYANTHEMACEAE	Ruschia indecora (L.Bolus) Schwantes		Melkbosstrand to Cape Peninsula	No change, **coastal dune endemic**				1		
MESEMBRYANTHEMACEAE	Ruschia macowanii (L.Bolus) Schwantes	bosvygie	Yzerfontein to Agulhas	Slight north easterly range extension, **coastal rocks and southern coast endemic**					1	1
MESEMBRYANTHEMACEAE	Ruschia misera (L.Bolus) L.Bolus		Clanwilliam	Major southerly range extension, Habitat? **Local endemic PREDOMINANTLY WEST COAST; SAS HAS IT FROM YZERFONTEIN TO MELKBOSSTRAND**			1			1
MOLLUGINACEAE	Adenogramma glomerata (L.f.) Druce	muggiegras	S Namibia to Humansdorp							

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
MOLLUGINACEAE	Pharnaceum incanum L.	regopsneeuwvygie	Namaqualand to Hopefield and Worcester	Slight southern range extension, rocky slopes						1
MOLLUGINACEAE	Pharnaceum lanatum Bartl.	wolhaarsneeuwvygie	Namaqualand and Karoo to Cape Peninsula	No change, sandy flats and slopes						
MOLLUGINACEAE	Pharnaceum microphyllum L.f.		Namaqualand to Saldanha Bay	Southerly range extension, coastal sands and limestones						1
MYRICACEAE	Morella cordifolia (L.) Killick	candle berry, dune waxberry, glashout, wasbessie, waxberry	Yzerfontein to E Cape	No change, coastal sands and limestones						
MYRICACEAE	Morella quercifolia (L.) Killick	maagpynbossie	Namaqualand to E Cape	No change, mostly coastal sandy and limestone flats						
NEURADACEAE	Grielum grandiflorum (L.) Druce	duikerwortel, platdoring	Namaqualand to Cape Peninsula	No change, sandy and stony coastal flats						
OLEACEAE	Olea exasperata Jacq.	slanghout	Cape Peninsula to E Cape	No change, coastal scrub on sand and						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
				limestone						
ONAGRACEAE	Epilobium hirsutum L.		Clanwilliam to Cape Peninsula to W Asia	No change, damp places						
OROBANCHACEAE	Harveya squamosa (Thunb.) Steud.	jakkaslbos	Lambert's Bay to Kleinmond	No change, **deep coastal sand endemic**					1	
OROBANCHACEAE	Hyobanche sanguinea L.	katnaels, wolwekos	S Namibia to Swaziland	No change, sandy slopes and flats, usually coastal, endemic						
OXALIDACEAE	Oxalis hirta L.	stamsuring	Bokkeveld Mts to Cape Peninsula	No change, flats and lower slopes, **Cape endemic**					1	
OXALIDACEAE	Oxalis luteola Jacq.	geelsuring	Bokkeveld Mts to Albertinia	No change, flats and lower slopes, **endemic**					1	
OXALIDACEAE	Oxalis obtusa Jacq.	geeloogsuring	Namaqualand and W Karoo to Port Elizabeth	No change, mostly clay and granite						
OXALIDACEAE	Oxalis pes-caprae L.	sorrel, suring	Namaqualand to E Cape	No change						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
OXALIDACEAE	Oxalis polyphylla Jacq.	fynblaarsuring	Malmesbury to Port Elizabeth	No change, on flats, **Cape flats endemic**					1	
OXALIDACEAE	Oxalis purpurea L.	grootsuring	Namaqualand and W Karoo to Port Elizabeth	Southern extension of distribution, flats and slopes						1
OXALIDACEAE	Oxalis versicolor L.	candystick suring	Clanwilliam to Hermanus	No change, flats and slopes, **Cape endemic**					1	
PLANTAGINACEAE	Plantago crassifolia Forssk.	fleshy plantain	Saldanha Bay to tropical Africa	No change, coastal sands and limestones						
PLUMBAGINACEAE	Afrolimon perigrinum (P.J.Bergius) Lincz.	strandroos	Namaqualand to Melkbosstrand	No change, coastal dunes						
PLUMBAGINACEAE	Afrolimon purpuratum (L.) Lincz.	papierblom	Mamre to Durbanville	No change, **coastal flats endemic**				1		
PLUMBAGINACEAE	Limonium billardieri (Girard) Kuntze		Velddrif to Bredasdorp	No change, **coastal dune endemic**					1	
PLUMBAGINACEAE	Limonium equisetinum (Boiss.) R.A.Dyer	seelaventel	Namaqualand to Bokbaai	No change, coastal and flats						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
PLUMBAGINACEAE	Limonium scabrum (Thunb.) Kuntze	brakblommetjie, sea lavender	Cape Peninsula to E Cape	No change, coastal dunes and estuaries						
POLYGALACEAE	Nylandtia spinosa (L.) Dumort.	bokbessie, skilpadbessie	Namaqualand and W Karoo to E Cape	No change, sandy flats and slopes						
POLYGALACEAE	Polygala garcinii DC.		Bokkeveld Mts to Knysna	Southern extension of distribution, sandy and clay slopes, **Cape endemic**					1	1
POLYGONACEAE	Emex australis Steinh.	devil's thorn, dubbeltjie, duiweltjie	Namaqualand and NW Province, Lambert's Bay to Uitenhage	No change, sandy and stony flats and lower slopes						
POLYGONACEAE	Rumex cordatus Poir.		Namaqualand and W Karoo to E Cape	No change, sandy flats and slopes						
POLYGONACEAE	Rumex lativalvis Meisn.	veldsuring	Clanwilliam to De Hoop, ?Uitenhage	No change, clay and limestone slopes and flats, **Cape endemic**					1	
POLYGONACEAE	Rumex sagittatus Thunb.		Riviersonderend Mts to Port Elizabeth, widespread in southern	No change, bush and forest margins						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
			Africa							
PROTEACEAE	Leucadendron levisanus (L.) P.J.Bergius	Cape Flats conebush	Mamre to Cape Flats	No change, damp sandy flats, **Cape flats endemic**				1		
PROTEACEAE	Leucadendron salignum P.J.Bergius	common sunshine conebush, geelbos, geeltolbos, knopbos, knoppiesbos, rooibos, stompieknopbos, sunshine bush	Bokkeveld Mts to Grahamstown	Southern extension of distribution, sand and clay slopes and flats						1
PROTEACEAE	Leucospermum hypophyllocarpodendron (L.) Druce subsp. canaliculatum (H.Buek.) ex Meisn.)	kruipluisiebos, slangbossie	Piketberg to Agulhas Coast	No change, sandy flats, **Cape endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
	Rourke									
PROTEACEAE	Protea repens (L.) L.	bierbos, common sugarbush, mebos, perdebos, soetstroopbos, stroopbos, sugarbush, suikerbos, suikerkan	Bokkeveld Mts to Grahamstown	No change, sandstone and clay flats						
PROTEACEAE	Serruria decipiens R.Br.	sandveld spiderhead, Weskusspinnekopbos	Olifants River Mts to Cape Flats	No change, coastal flats and slopes, **coastal endemic**					1	
PROTEACEAE	Serruria fasciflora Salisb. ex Knight	fynspinnekopbos, spinnekopbos, spinnekopbossie	Hopefield to George	South westerly range extension, sandy flats and lower slopes, endemic						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
RHAMNACEAE	Phylica cephalantha Sond.	tolhardeblaar	Olifants River mouth and Cedarberg Mts to Cape Peninsula	No change, sandy flats and lower slopes, **Cape endemic**					1	
RHAMNACEAE	Phylica ericoides L.		Saldanha to Port Elizabeth	No change, **coastal dune endemic**					1	
RHAMNACEAE	Phylica harveyi (Arn.) Pillans		Piketberg to Cape Peninsula	No change, **coastal dune endemic**					1	
RHAMNACEAE	Phylica plumosa L.	veerkoppie	Piketberg to Cape Peninsula and Caledon	No change, clay and granite soils, **Cape endemic**					1	
RHAMNACEAE	Trichocephalus stipularis (L.) Brongn.	hondegesiggie	Cedarberg Mts to Knysna	Southern extension of distribution, sandy flats and lower slopes, **Cape endemic**					1	
ROSACEAE	Cliffortia falcata L.f.		Cape Peninsula to Knysna	No change, **coastal dune endemic**					1	
ROSACEAE	Cliffortia juniperina L.f.		Namaqualand to Caledon	No change, granite and sandstone slopes						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ROSACEAE	Cliffortia polygonifolia L. var. polygonifolia		Clanwilliam to Bredasdorp	No change, flats and lower slopes, **Cape endemic**					1	
RUBIACEAE	Anthospermum aethiopicum L.		Bokkeveld Escarpment to E Cape	Southern Range extension, clay slopes						1
RUBIACEAE	Anthospermum prostratum Sond.		Saldanha to Port Elizabeth	No change, coastal dune endemic						
RUBIACEAE	Anthospermum spathulatum Spreng. subsp. spathulatum	skaapbos	Namaqualand to E Cape	No change, sandy soils						
RUBIACEAE	Galium tomentosum Thunb.	kleefgras	S Namibia to E Cape and Free State	No change, scrub						
RUTACEAE	Agathosma imbricata (L.) Willd.	sand buchu, sandboegoe	Tulbagh to Knysna	Southern extension of distribution, granite, limey or sandy well-drained or seasonally damp slopes and flats						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
RUTACEAE	Agathosma serpyllacea Licht. ex Roem. & Schult.		Piketberg to Humansdorp	Southern extension of distribution, coastal or inland sand or limestone flats and slopes, **Cape endemic**					1	
RUTACEAE	Diosma aspalathoides Lam.	haasboegoe	Hopefield to Milnerton	No change, **coastal dune endemic**		1				
RUTACEAE	Diosma dichotoma P.J.Bergius		Hopefield to False Bay	No change, **coastal dune endemic**						
RUTACEAE	Diosma hirsuta L.	rooiboegoe	Cedarberg Mts to Humansdorp	No change, sandstone and clay slopes, **Cape endemic**					1	
RUTACEAE	Diosma oppositifolia L.	bitterboegoe	Darling to Bredasdorp and Agulhas	No change, sandstone, granite and limestone slopes, Cape endemic						
SANTALACEAE	Osyris compressa (P.J.Bergius) A.DC.	pruimbas	Cedarberg Mts to tropical Africa	Southern extension of distribution, sandstone slopes						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
SANTALACEAE	Thesidium fragile (Thunb.) Sond.	breekgroenbasbossie	Little Karoo, Saldanha Bay to E Cape	No change, sandy flats and slopes						
SANTALACEAE	Thesium aggregatum A.W.Hill		Namaqualand to Bredasdorp, Humansdorp	No change, sandstone flats and slopes						
SANTALACEAE	Thesium frisea L.		Elandsbaai to Uitenhage	No change, sandstone slopes and flats, **Cape endemic**					1	
SANTALACEAE	Thesium pubescens DC.		Olifants River Mts to Cape Peninsula, ?Witteberg	No change, sandstone slopes, **Cape endemic**					1	
SANTALACEAE	Thesium scabrum L.		Hex River Mts to Cape Peninsula and Agulhas	No change, sandstone slopes, **Cape endemic**					1	
SANTALACEAE	Thesium spicatum L.	lidjes'tee	Cape Peninsula to Riviersonderend Mts	No change, sandstone slopes, **Cape endemic**					1	
SANTALACEAE	Thesium strictum P.J. Bergius		S Namaqualand to Grahamstown	Southern extension of distribution, sandstone slopes						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
SANTALACEAE	Thesium virgatum Lam.		Cedarberg to Port Elizabeth	No change, stony flats and lower slopes, **endemic**					1	
SCROPHULARIACEAE	Diascia diffusa Benth.	eenooghorinkie	Piketberg to Cape Peninsula	No change, fynbos and renosterveld in sand or loam, **Cape endemic**					1	
SCROPHULARIACEAE	Dischisma ciliatum (P.J.Bergius) Choisy subsp. ciliatum		Lokenberg to Port Elizabeth	No change, rocky slopes and flats, **Cape endemic**					1	
SCROPHULARIACEAE	Hebenstretia dentata L.	slakblom	Namaqualand to Cape Peninsula	No change, rocky sandstone soils						
SCROPHULARIACEAE	Hebenstretia repens Jaroscz	witslakblom	Namaqualand to Albertinia	No change, sand flats and slopes,						
SCROPHULARIACEAE	Hebenstretia robusta E.Mey.	bosslakblom	Namaqualand to Uniondale and E Cape	No change, rocky sandstone soils						
SCROPHULARIACEAE	Hemimeris racemosa (Houtt.) Merr.	geelgesiggie	Richtersveld to Port Elizabeth	Southern extension of distribution, coastal and inland sands and						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
				clay						
SCROPHULARIACEAE	Hemimeris sabulosa L.f.	sandgeelgesiggie	Namaqualand to Stilbaai	No change, sandy coastal flats						
SCROPHULARIACEAE	Lyperia lychnidea (L.) Druce	soettraanblommetjie	Saldanha Bay to Stilbaai	No change, coastal sands in scrub, **West Coast endemic**					1	
SCROPHULARIACEAE	Lyperia tristis (L.f.) Benth.	traanblommetjie	Namibia through W Cape and Karoo to Willowmore	No change, sandy, gravelly or stony ground						
SCROPHULARIACEAE	Manulea rubra L.f.	rooivingertjies	Velddrif to Somerset West	No change, sandy flats near coast, **West Coast endemic**					1	
SCROPHULARIACEAE	Manulea thyrsiflora L.f.		Velddrif to Blouberg and De Hoop to Stilbaai	No change, **coastal dune endemic**					1	
SCROPHULARIACEAE	Manulea tomentosa (L.) L.	duinevingertjies	Saldanha Bay to Pearly Beach	No change, **coastal dune endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
SCROPHULARIACEAE	Nemesia affinis Benth.	bontleeubekkie, leeubekkie, weeskindertjie(s)	S Namibia to E Cape	Southern extension of distribution, sandy and granite slopes and flats						1
SCROPHULARIACEAE	Nemesia bicornis (L.) Pers.	witleeubekkie	Namaqualand to Stilbaai	No change, coastal sands						
SCROPHULARIACEAE	Nemesia strumosa (Herb. Banks ex Benth.) Benth.	balsamienie, nemesia	Hopefield to Melkbos	No change, **sandveld endemic**	1					
SCROPHULARIACEAE	Oftia africana (L.) Bocq.	sukkelbossie	Bokkeveld Mts to Uitenhage	No change, sandstone and granite slopes, **Cape endemic**					1	
SCROPHULARIACEAE	Phyllopodium cephalophorum (Thunb.) Hilliard	perskopopslag	S Namaqualand to Cape Peninsula	No change, sandy flats						
SCROPHULARIACEAE	Phyllopodium heterophyllum (L.f.) Benth.		S Namaqualand to Beaufort West	South western extension of distribution, sandy flats and slopes						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
SCROPHULARIACEAE	Phyllopodium phyllopodioides (Schltr.) Hilliard	persopslag	S Namaqualand to Saldanha Bay	Southern extension of distribution, sandy flats						1
SCROPHULARIACEAE	Polycarena capensis (L.) Benth.	geelopslag	Hopefield to Cape Peninsula	No change, sandy soils, **West Coast endemic**	1					
SCROPHULARIACEAE	Zaluzianskya villosa F.W.Schmidt	drumsticks	Langebaan to Pearly Beach	No change, sandy flats, **coastal dune endemic**					1	
SOLANACEAE	Lycium afrum L.	bokdoring, kraal honey thorn, kraalkriekdoring	Lambert's Bay to Uitenhage	No change, stony slopes and flats, **west and south coast endemic**					1	
SOLANACEAE	Lycium ferocissimum Miers	karriedoring, slangbessie	Namaqualand and W Karoo to E Cape	Southern extension of distribution, dry stony flats						1
SOLANACEAE	Solanum africanum Mill.	dronkbessie, dronktou, melkellie	Cape Peninsula to KwaZulu-Natal	No change, coastal dunes						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
SOLANACEAE	Solanum guineense L.	melkellie	Namaqualand to E Cape	Southern extension of distribution, coastal dunes						1
SOLANACEAE	Solanum nigrum L.		Cape Peninsula to Eurasia	No change						
THYMELAEACEAE	Lachnaea grandiflora (L.f.) Baill.	grootletjiesbos	Cedarberg to Agulhas	No change, sandy flats and lower slopes, **Cape endemic**					1	
THYMELAEACEAE	Lachnaea uniflora (L.) Beyers	letjiesbos	Porterville to Yzerfontein and Hottentots Holland Mts	No change, sandy flats and rocky sandstone slopes, **Cape endemic**					1	
THYMELAEACEAE	Passerina corymbosa Eckl. ex C.H.Wright	sandgannabos	Tulbagh to E Cape	No change, sandy, often disturbed flats and slopes						
THYMELAEACEAE	Passerina ericoides L.		Blouberg to Hermanus	No change, **coastal dune and southern coast endemic**		1				
THYMELAEACEAE	Passerina paleacea		Saldanha Bay to Agulhas	No change, **coastal**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
	Wikstr.			**dune endemic**						
THYMELAEACEAE	Passerina rigida Wikstr.	gonnabas	Cape Peninsula to KwaZulu-Natal	No change, **coastal dune endemic**					1	
THYMELAEACEAE	Struthiola leptantha Bolus	roemenaggie, veertjite	Namaqualand to Malmesbury and Little Karoo	Southern extension of distribution, sandy flats and mountain slopes						1
URTICACEAE	Didymodoxa capensis (L.f.) Friis & Wilmot-Deare		Namibia and Namaqualand to Knysna	No change, sheltered sites, forest margins and clearings						
VISCACEAE	Viscum capense L.f.	Cape mistletoe, mistletoe, voëlent	S Namibia to Caledon	No change, parasite						
ZYGOPHYLLACEAE	Roepera flexuosum Eckl. & Zeyh.	spekbossie	Velddrif to Knysna	No change, **coastal sand and limestone endemic**					1	
ZYGOPHYLLACEAE	Roepera fulva L.	spekbossie	Gifberg to Port Elizabeth	No change, sandy flats and rocky slopes, endemic					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ZYGOPHYLLACEAE	Roepera morgsana L.	skilpadbos, slaaibos	S Namibia to Grahamstown	No change, sandy and stony slopes						
AMARYLLIDACEAE	Brunsvigia orientalis (L.) Aiton ex Eckl.	candelabra flower, kandelaar, koningskandelaar(b lom)	S Namaqualand to Cape Peninsula and Knysna	No change, sandy coastal lowlands						
AMARYLLIDACEAE	Crossyne guttata (L.) D. & U.Mull.-Doblies	haarblom, sambreelblom, seeroogblom	Piketberg to Swellendam	Southern extension of distribution, shale and granite flats and lower slopes, **Cape endemic**					1	1
AMARYLLIDACEAE	Gethyllis ciliaris (Thunb.) Thunb.	kukumakranka	Namaqualand to Cape Peninsula	No change, flats						
AMARYLLIDACEAE	Haemanthus coccineus L.	April fool, poeierkwas, rooikwas, velskoenblaar	S Namibia to Port Elizabeth	No change, coastal scrub and rocky slopes						
AMARYLLIDACEAE	Haemanthus pubescens L.f. subsp.	poeierkwas	Namaqualand to Cape Peninsula and Worcester	No change, sandy flats						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
	pubescens									
ANTHERICACEAE	Chlorophytum triflorum (Aiton) Kunth	gifkool	Elandsbaai to Cape Peninsula	No change, sandy slopes and flats, **West Coast endemic**					1	
APONOGETONACEAE	Aponogeton angustifolius Aiton	wateruintjie	Malmesbury to Worcester	South western extension of distribution, **Cape endemic**		1				1
ARACEAE	Zantedeschia aethiopica (L.) Spreng.	arum, arum lily, calla lily, pig lily, varkblom	Richtersveld, Kamiesberg, Bokkeveld Mts to N Province	No change, sandy or rocky places, seasonally damp						
ASPARAGACEAE	Asparagus aethiopicus L.		Namaqualand to Transkei	Southern extension of distribution, dry bush						1
ASPARAGACEAE	Asparagus asparagoides (L.) Druce	breëblaarklimop, breëblaarkransie, krulkransie	Gifberg to Port Elizabeth to tropical Africa	No change, widespread in bush						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASPARAGACEAE	Asparagus capensis L.	katbos, katdoring, wag-'n-bietjie, wag-'n-bietjiebos	S Namibia to Transkei	No change, rocky slopes						
ASPARAGACEAE	Asparagus declinatus L.		S Namibia to Riversdale	No change, rock outcrops, fynbos and coastal scrub						
ASPARAGACEAE	Asparagus lignosus Burm.f.	withaakdoring	Clanwilliam to Mossel Bay	No change, sandstone slopes and marshy flats, **Cape endemic**					1	
ASPARAGACEAE	Asparagus rubicundus P.J.Bergius	swarthaakdoring	Kamiesberg, Gifberg to Uitenhage	Southern extension of distribution, sandy and granite slopes						1
ASPHODELACEAE	Bulbine annua (L.) Willd.	geelkwassie, kopieva	Saldanha to Riversdale	No change, stony flats and slopes, **Cape endemic**					1	
ASPHODELACEAE	Trachyandra ciliata (L.f.) Kunth	hotnotskool, wildeblomkool	Namibia to Grahamstown	No change, damp sandy coastal flats						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
ASPHODELACEAE	Trachyandra divaricata (Jacq.) Kunth	duinekool, hottentotskool	Namaqualand to Port Alfred	No change, littoral dunes and sand flats						
ASPHODELACEAE	Trachyandra falcata (L.f.) Kunth	bokkool, hotnotskool, Namakwakool, veldkool	Namibia to Worcester and W Karoo	Southern extension of distribution, sandy or clay flats and slopes, karroid scrub						1
ASPHODELACEAE	Trachyandra muricata (L.f.) Kunth	beesblom, rolboskool	S Namibia to Caledon	Southern extension of distribution, stony clay slopes in karroid scrub and renosterveld						1
ASPHODELACEAE	Trachyandra revoluta (L.) Kunth		Richtersveld to Port Alfred	No change, sandy flats						
ASPHODELACEAE	Trachyandra sabulosa (Adamson) Oberm.		Hopefield to Cape Agulhas	No change, **coastal flats endemic**					1	
COLCHICACEAE	Ornithoglossum viride (L.f.) Aiton	eendjies, groenspinnekoppie, slangkop	Clanwilliam to Riversdale	Southern extension of distribution, deep sandy soils, **Cape endemic**					1	1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
CYPERACEAE	Bolboschoenus maritimus (L.) Palla	sedge, snygras, snyruigte	Clanwilliam to tropical Africa, pantropical	Southern extension of distribution, marshy flats near water, mainly coastal, below 700m						1
CYPERACEAE	Cyperus textilis Thunb.	mat sedge, matjiesgoed, umbrella sedge	Piketberg to S KwaZulu-Natal	No change, marshes and watercourses below 150m						
CYPERACEAE	Ficinia argyropa Nees		Namaqualand to Riversdale	No change, sandy flats near coast						
CYPERACEAE	Ficinia bulbosa (L.) Nees		Cedarberg Mts to E Cape	No change, strandveld, coastal and mountain fynbos						
CYPERACEAE	Ficinia capitella (Thunb.) Nees		W Karoo, Ceres to Caledon	Southern extension of distribution, flats and slopes below 1700m						1
CYPERACEAE	Ficinia dunensis Levyns		Cedarberg Mts to Port Elizabeth	No change, coastal dunes or mountain slopes, **Cape endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
CYPERACEAE	Ficinia indica (Lam.) Pfeiffer	knoppiesbiesie	Namaqualand to E Cape	No change, flats and lower slopes						
CYPERACEAE	Ficinia lateralis (Vahl) Kunth		Cape Peninsula to E Cape	No change, coastal sands						
CYPERACEAE	Ficinia nodosa (Rottb.) Goetgh.	steekbiesie, vleibiesie	Namaqualand to Kwa-Zulu Natal and widespread in S hemisphere	No change, damp sandy flats in coastal areas						
CYPERACEAE	Ficinia oligantha (Steud.) J.Raynal		Clanwilliam to Knysna	Southern extension of distribution, lower slopes, **Cape endemic**					1	1
CYPERACEAE	Ficinia pygmaea Boeck.		Lambert's Bay to Bredasdorp	No change, **coastal dune endemic**					1	
CYPERACEAE	Ficinia secunda (Vahl) Kunth		Cedarberg Mts to Mossel Bay	Southern extension of distribution, sandy flats below 1000m, **Cape endemic**					1	1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
CYPERACEAE	Hellmuthia membranacea (Thunb.) R.Haynes & K.Lye	biesie, knopbiesie	Saldanha to Knysna	No change, **coastal dune endemic**					1	
CYPERACEAE	Isolepis antarctica (L.) Roem. & Schult.		Cape Peninsula to Langeberg Mts	No change, damp flats and slopes, **Cape endemic**					1	
CYPERACEAE	Isolepis cernua (Vahl) Roem. & Schult.		Cape Peninsula to Port Elizabeth, cosmopolitan	No change, marshes and watercourses						
CYPERACEAE	Isolepis marginata (Thunb.) A.Dietr.		Namaqualand to E Cape, also Australia	No change, dunes, flats and slopes in seasonally damp sandy soil						
CYPERACEAE	Isolepis rubicunda Kunth		Langebaan to Cape Peninsula	Northern extension of distribution, seasonal pools on flats or lower slopes, **West Coast endemic**		1				1
CYPERACEAE	Isolepis venustula Kunth		Cape Peninsula to Caledon	No change, **coastal flats endemic**		1				

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
CYPERACEAE	Scirpoides thunbergii (Schrad.) Soják	steekbiesie	Cape Peninsula to E Cape	No change, damp flats near coast to 300m						
HAEMODORACEAE	Wachendorfia multiflora (Klatt) J.C. Manning and Goldblatt	kleinrooikanol	Namaqualand to Cape Peninsula and Robertson	No change, sandstone and granitic soils						
HAEMODORACEAE	Wachendorfia paniculata Burm.	koffiepit, rooikanol, spinnekopblom	Bokkeveld Mts to Port Elizabeth	Southern extension of distribution, sandstone and granitic soils, **Cape endemic**					1	1
HEMEROCALLIDACEAE	Caesia contorta (L.f.) T.Durand & Schinz	sokkiesblom	Namaqualand to Stutterheim	No change, sandstone slopes						
HYACINTHACEAE	Albuca flaccida Jacq.	geldbeursie, sandpypie, slangtamarak, soldier-in-the-box	S Namaqualand to Stilbaai	No change, coastal in deep sandy soils						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
HYACINTHACEAE	Albuca maxima Burm.f.	bloustok, geldbeursie, kamiemie, slymstok, soldier-in-the-box, wittamarak	Namaqualand to Riversdale	Southern extension of distribution, rocky sandstone or granitic soils						1
HYACINTHACEAE	Drimia fragrans (Jacq.) J.C.Manning & Goldblatt		Namaqualand: Hondeklipbaai, and Bokkeveld Mts to Hex River Valley	Southern extension of distribution, **Cape flats endemic**					1	1
HYACINTHACEAE	Lachenalia bulbifera (Cyrillo) Engl.	rooinaeltjie	Klawer to Mossel Bay	No change, **coastal dune endemic**					1	
HYACINTHACEAE	Lachenalia rubida Jacq.	bergnaeltjie, rooiviooltjie, sandkalossie, sandviooltjie	Hondeklipbaai to Cape Peninsula to George	No change, sandy flats and slopes, **coastal endemic**					1	
HYACINTHACEAE	Lachenalia variegata W.F.Barker		Clanwilliam to Cape Peninsula	No change, deep sand, mainly coastal, **Cape endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
IRIDACEAE	Aristea africana (L.) Hoffmanns.	blousuurkanol, koringblommetjie, maagbossie	Gifberg to Bredasdorp and Riversdale	Southern extension of distribution, sandy flats and mountain slopes, **Cape endemic**					1	1
IRIDACEAE	Aristea dichotoma (Thunb.) Ker-Gawl.	venstervrug	Namaqualand to Cape Peninsula	No change, sandy flats and lower slopes						
IRIDACEAE	Babiana ringens (L.) Ker Gawl.	antholyza, hanekam, rooibobbejaanuintjie, rotstert	Bokkeveld Mts to Bredasdorp	No change, **Cape flats endemic**						
IRIDACEAE	Babiana tubulosa (Burm.f.) Ker Gawl. var. tubulosa	witbobbejaantjie	Elandsbaai to Riversdale	No change, sandy flats and lower slopes, **south west coast endemic**					1	
IRIDACEAE	Ferraria crispa Burm. subsp. crispa	krulletjie, spinnekopblom, uiltjie	Lambert's Bay to Mossel Bay, Little Karoo	No change, coastal, sandstone or granite rocks, **Cape endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
IRIDACEAE	Gladiolus carinatus Aiton	blou-afrikaner, blue afrikaner, mauve afrikaner, sandpypie	Namaqualand to Knysna	No change, sandstone slopes or deep coastal sands						
IRIDACEAE	Gladiolus cunonius (L.) Gaertn.	lepelblom, lippypie, rooipypie, suikerkannetjie	Saldanha to Knysna	No change, **coastal endemic**					1	
IRIDACEAE	Lapeirousia anceps (L.f.) Ker Gawl.	pienkkoringblom	S Namaqualand to Mossel Bay	No change, deep sand or stony slopes in fynbos						
IRIDACEAE	Melasphaerula ramosa (L.) N.E.Br.	baardmannetjie, bokbaardjie, feëklokkie	S Namibia to De Hoop and Swartberg Mts	No change, sandstone or limestone slopes						
IRIDACEAE	Moraea fugax (D.Delaroche) Jacq.	hottentotsbrood, hottentotsuintjie, hottentotuintjie, soetuintjie, uintjie	Namaqualand to Swellendam	Southern extension of distribution, deep sands and rocky sandstone and granitic soils						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
IRIDACEAE	Moraea tripetala (L.f.) Ker Gawl.	blou-uintjie, dwergtulp, kleinuintjie, perde-uintjie, tulp	Bokkeveld Mts and W Karoo to Riversdale and Swartberg Mts	Southern extension of distribution, rocky sandstone and clay soils						1
IRIDACEAE	Romulea obscura Klatt	kolfroetang	Clanwilliam to Agulhas	No change, **West Coast flats endemic**					1	
IRIDACEAE	Romulea rosea (L.) Eckl.	froetang, frutang, knikker, knikkertjie, rooiknikkertjie	Bokkeveld Mts to Port Elizabeth and W Karoo	Southern extension of distribution, sandy and clay slopes and flats, **Cape endemic**					1	1
IRIDACEAE	Romulea tabularis Eckl. ex Beg.	bloufroetang	S Namaqualand to Agulhas	No change, moist, sandy or limestone flats						
IRIDACEAE	Watsonia meriana (L.) Mill.	lakpypie, rooikanol, suurkanolpypie, waspypie	Namaqualand to Bredasdorp	No change, sandy or granitic soils, often vleis and stream banks						
JUNCACEAE	Juncus kraussii Hochst. subsp. kraussii	biesie, rush	Cape Peninsula to Mozambique, Australia,	No change, saline marshes						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
			South America							
JUNCAGINACEAE	Triglochin bulbosa L.	bolletjieblom	Bokkeveld Mts to tropical Africa and Mediterranean	No change, damp or marshy places						
ORCHIDACEAE	Corycium crispum (Thunb.) Sw.	bastertrewwa, geelbastertrewwa	Namaqualand to Albertinia	No change, sandy flats						
ORCHIDACEAE	Corycium orobanchoides (L.f.) Sw.	bastertrewwa	Klawer to Albertinia	Southern extension of distribution, **Cape flats endemic**					1	1
ORCHIDACEAE	Disa draconis (L.f.) Sw.	lilac disa, white disa, witdisa	Yzerfontein to Cape Peninsula	No change, **West Coast and flats endemic**		1				
ORCHIDACEAE	Disperis villosa (L.f.) Sw.	babakappie, moederkappie, oumakappie	Clanwilliam to Mossel Bay and Port Elizabeth	No change, clay and granite slopes, **Cape endemic**					1	
ORCHIDACEAE	Satyrium carneum (Dryand.) Sims	rooikoppie, rooitrewwa	Cape Peninsula to Riversdale	No change, **coastal flats endemic**					1	

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
POACEAE	Aristida junciformis Trin. & Rupr.	wire grass	Cedarberg Mts to tropical E Africa	Southern extension of distribution, mountain slopes						
POACEAE	Cladoraphis cyperoides (Thunb.) S.M.Phillips	biesie-eragrotis, seebiesie, steekriet	Angola to Cape Peninsula	No change, coastal dunes						
POACEAE	Cynodon dactylon (L.) Pers.	Bermuda grass, couch, fine quick grass, fynkweek, gewone kweekgras	throughout Africa	No change, mountains and flats						
POACEAE	Ehrharta brevifolia Schrad. var. brevifolia		Namaqualand to Agulhas	No change, sandy coastal flats						
POACEAE	Ehrharta calycina Sm.	common ehrharta, polgras, rooigras, rooisaadgras	Namaqualand to KwaZulu-Natal	No change, flats and slopes						
POACEAE	Ehrharta delicatula		S Namibia to	No change, shady						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
	(Nees) Stapf		Swellendam	habitats						
POACEAE	Ehrharta erecta Lam.		Cape Peninsula to E Africa	No change, shady habitats						
POACEAE	Ehrharta longiflora J.E.Sm.		Namaqualand to Mossel Bay	No change, damp or shady habitats						
POACEAE	Ehrharta villosa Schult.f. var. villosa	pypgras	St. Helena Bay to Port Elizabeth	No change, **coastal dune endemic**					1	
POACEAE	Imperata cylindrica (L.) Raeuschel	beddinggras, cotton-wool grass, donsgras, silwergaargras, sygras	tropical African weed	No change, wet habitats						
POACEAE	Pentaschistis barbata (Nees) H.P.Linder subsp. barbata		Elandsbaai to Betty's Bay and Knysna	No change, **coastal dune endemic**					1	
POACEAE	Pentaschistis pallida (Thunb.) H.P.Linder	duinegras, haasgras	Namaqualand to E Cape	No change, slopes and flats						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
POACEAE	Phragmites australis (Cav.) Trin. ex Steud.	common reed, fluitjiesriet	worldwide	No change, marshes, streams and seeps						
POACEAE	Sporobolus virginicus (L.) Kunth	brakgras, brakkweek, sea rush grass	worldwide	No change, dunes, beaches and coastal marshes						
POACEAE	Stipagrostis zeyheri (Nees) De Winter	Cape Bushman grass, steekgras	Namaqualand to Mpumalanga	No change, sandy flats						
POACEAE	Tribolium hispidum (Thunb.) Desv.	haasgras	Namaqualand to E Cape	No change, flats and slopes						
POACEAE	Tribolium uniolae (L.f.) Renvoize	koringgras	Bokkeveld Mts to Port Elizabeth	Southern extension of distribution, **Cape endemic**					1	1
RESTIONACEAE	Calopsis fruticosa (Mast.) H.P.Linder		Cape Peninsula to Gouritz River mouth (Linder, 2002	No change, **coastal limestone endemic**					1	
RESTIONACEAE	Calopsis viminea (Rottb.) H.P.Linder		Namaqualand to Port Elizabeth	No change						

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
RESTIONACEAE	Elegia coleura Nees ex Mast.		Cape Peninsula to Humansdorp	No change, **Cape flats endemic**						
RESTIONACEAE	Elegia microcarpa (Kunth) Pillans		Melkbos to Port Elizabeth	No change, **coastal dune and limestone endemic**					1	
RESTIONACEAE	Elegia nuda (Rottb.) Kunth		Darling to Albertinia	No change, **Cape flats endemic**					1	
RESTIONACEAE	Elegia recta (Mast.) Moline & H P Linder		Cape Peninsula to Agulhas	No change, **Cape flats endemic**					1	
RESTIONACEAE	Elegia tectorum (L.f.) Raf.	besemriet, dakriet, dekriet, olifantriet	Clanwilliam to Port Elizabeth	Southern extension of distribution, marshes and seeps on deep sands, **Cape endemic**					1	1
RESTIONACEAE	Ischyrolepis capensis (L.) H.P.Linder		Clanwilliam to Port Elizabeth	Southern extension of distribution, mostly clay slopes, **Cape endemic**					1	1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
RESTIONACEAE	Ischyrolepis eleocharis (Nees ex Mast.) H.P.Linder	katstert, katstertriet	Cape Peninsula to Port Elizabeth	No change, **coastal limestone endemic**					1	
RESTIONACEAE	Thamnochortus erectus (Thunb.) Mast.	dekriet, jakkalsstert, jakkalsstertriet, wyfieriet	Malmesbury to Knysna	No change, **Cape endemic**					1	
RESTIONACEAE	Thamnochortus obtusus Pillans		Saldanha to Agulhas	No change, **coastal flats endemic**					1	
RESTIONACEAE	Thamnochortus punctatus Pillans	steenboksriet	Bokkeveld Mts to Cape Peninsula	No change, sandy flats and slopes, **Cape endemic**					1	
RESTIONACEAE	Thamnochortus spicigerus (Thunb.) Spreng.	dekriet, duineriet, olifantsriet, swartriet	Langebaan to Cape Peninsula	No change, coastal sands, **strandveld endemic**		1				
RESTIONACEAE	Willdenowia arescens Kunth		Namaqualand to Malmesbury and Worcester	Southern extension to distribution						1

APPENDIX 4.1.3. DISTRIBUTION OF SPECIES RECORDED AT DUYNEFONTEIN: ENDEMICS

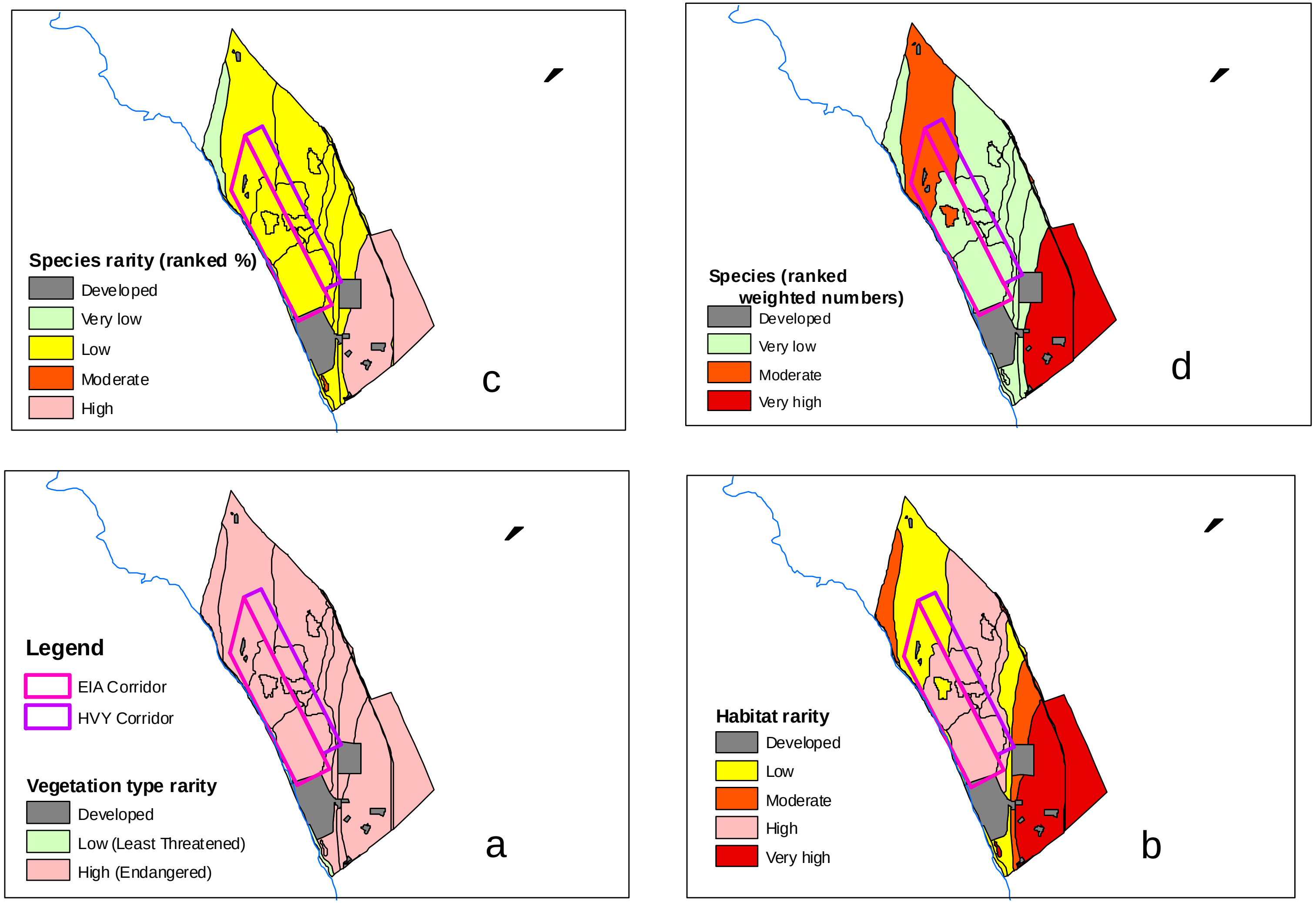
Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemic	Regional and Habitat endemic	Local endemic	Local and Habitat endemic	>100 km range, Habitat endemic	Range extension
RESTIONACEAE	Willdenowia incurvata (Thunb.) H.P.Linder	sonkwasriet	Namaqualand to Cape Peninsula	No change, sandy coastal flats						
RESTIONACEAE	Willdenowia sulcata Mast.		Witteberg and Bonteberg	Southern extension of distribution, rocky sandstone soils, endemic					1	1
RESTIONACEAE	Willdenowia teres Thunb.		Ceres to Uniondale	South western extension of distribution, **Cape endemic**					1	1
TECOPHILAEACEAE	Cyanella hyacinthoides L.	blouraaptol, lady's hand, raaptoluintjie	Namaqualand to Riversdale	No change, clay and granite slopes, often in renosterveld						
TYPHACEAE	Typha capensis (Rohrb.) N.E.Br.	bulrush, matjiesgoed, papkuil	southern and tropical Africa	No change, stream banks and marshes						
TOTAL					**2**	**11**	**1**	**7**	**132**	**76**

APPENDIX 4.1.4. CALCULATION OF RARITY & SENSITIVITY AT DUYNEFONTEIN

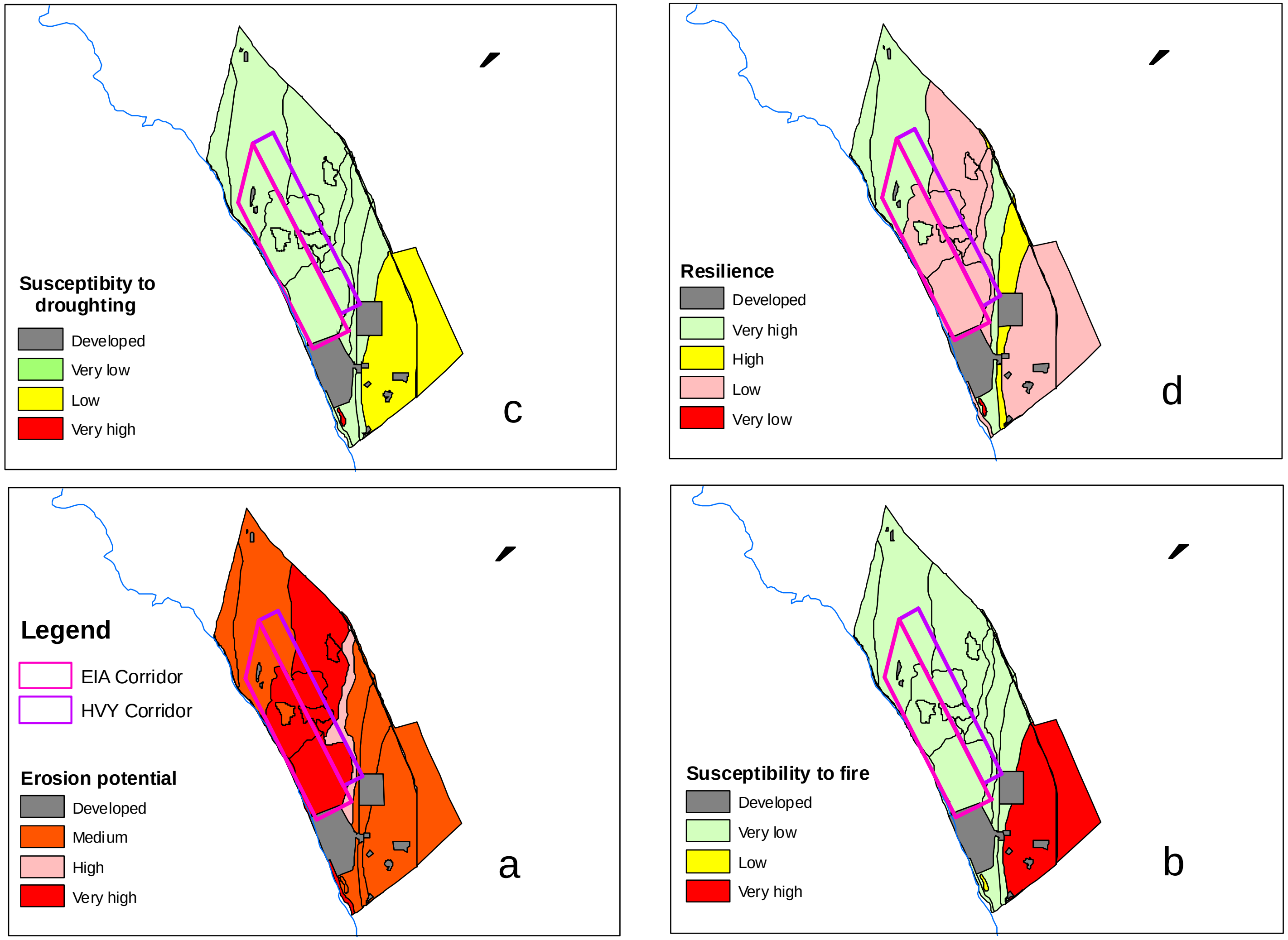
Plant community no.	Description	Plant community	Vegetation type	Rarity										Sensitivity					
				Conservation status	No Red Data species	VegType	Habitat	% RD spp	Species rarity rating	Weighted spp rarity	Weighted spp rarity rating	Overall rarity	Rarity class	Erosion potential	Proneness to fire	Proneness to droughting	Resilience	Total sensitivity	Sensitivity class
K1 & K2	Embryo and foredunes	Primary & foredunes at coast	Cape Seashore Vegetation	LT	3	1	2	5.0	1	8	1	9	2	5	1	1	4	24	4
K3	Unvegetated and vegetated transverse dunes	Dune fynbos and thicket on transverse dunes	Cape Flats Dune Strandveld	E	4	3	4	7.8	2	9	1	20	4	5	1	1	4	24	4
K4	Transition between parabolics and transverse dunes (not sampled – data from transverse dunes used)	Dune fynbos and thicket in transition between transverse and parabolic dunes	Cape Flats Dune Strandveld	E	4	3	4	7.8	2	9	1	20	4	5	1	1	4	24	4
K5	Dwarf thicket in south	Dwarf thicket on southern parabolic dunes	Cape Flats Dune Strandveld	E	3	3	2	4.3	1	7	1	13	3	3	1	1	1	11	2
K6	Dwarf thicket on deflated parabolic dunes in north	Dwarf thicket on northern deflated parabolic dunes	Cape Flats Dune Strandveld	E	1	3	3	1.4	1	3	1	16	4	3	1	1	1	11	2
K7	Tall thicket and fynbos of parabolic dunes in north	Tall dune thicket of parabolics in central and northern parts	Cape Flats Dune Strandveld	E	4	3	2	3.7	1	11	2	13	3	3	1	1	1	11	2
K8	Tall thicket on low parabolic dunes on	Tall thicket on deflated parabolic	Cape Flats Dune Strandveld	E	4	3	3	4.7	1	10	1	16	4	3	1	1	2	14	2

APPENDIX 4.1.4. CALCULATION OF RARITY & SENSITIVITY AT DUYNEFONTEIN

Plant community no.	Description	Plant community	Vegetation type	Rarity										Sensitivity					
				Conservation status	No Red Data species	VegType	Habitat	% RD spp	Species rarity rating	Weighted spp rarity	Weighted spp rarity rating	Overall rarity	Rarity class	Erosion potential	Proneness to fire	Proneness to droughting	Resilience	Total sensitivity	Sensitivity class
	eastern flats	dunes in east																	
K9 (not mapped)	Thicket and fynbos on calcretes	Thicket and fynbos on calcretes & limestone outcrops	Cape Flats Dune Strandveld	E	0	3	4	0.0	0	0	0	18	4	3	3	3	3	21	4
K10	Dune thicket/sand plain fynbos transition on acid to neutral sandy flats		Atlantis Sand Fynbos	E	15	3	5	12.0	3	48	5	24	5	3	5	2	4	25	4
K11	Brack wetland in south		(Cape Inland Salt Pans)	E	2	3	5	6.5	2	6	1	23	5	3	5	5	5	31	5



Appendix 4.1.5. Rarity at Duynefontein, showing position of proposed nuclear power station footprints. a: vegetation type; b: habitat; c: species (%); d: species (weighted numbers). Rarity calculated from values in Appendix 4.1.4



Appendix 4.1.6. Ecological sensitivity at Duynefontein, showing proposed nuclear power station footprints. a: erosion potential; b: susceptibility to droughting; c: proneness to fire; d: plant community resilience. Sensitivity calculated from values in Appendix 4.1.4

APPENDIX 4.2.1. PLANT SPECIES RECORDED FROM BANTAMSKLIP: INDIVIDUAL LISTS

NT: Near Threatened; R: Rare, VU: vulnerable EN: Endangered, CR: Critically Endangered

LC: Least Concern; DD: Data Deficient; De: Declining

COMMUNITY BK1: ROCKY SHORE

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
Tetragonia
decumbens Mill.
AMARANTHACEAE
Bassia
diffusa (Thunb.) Kuntze
APIACEAE
Torilis
arvensis (Huds.) Link
APOCYNACEAE
Cynanchum
obtusifolium L.f.
ASTERACEAE
Arctotheca
calendula (L.) Levyns
Chrysanthemoides
monilifera (L.) Norl.
Cineraria
cf. geifolia (L.) L.
Cotula
turbinata L.
Helichrysum
cf. dasyanthum (Willd.) Sweet
Metalasia
cf. muricata (L.) D.Don.
Senecio
elegans L.
cf. maritimus L.
CARYOPHYLLACEAE
Silene
bellidioides Sond.
CRASSULACEAE
Crassula
cf. glomerata P.J.Bergius
EBENACEAE
Euclea
racemosa Murray
LAMIACEAE
Salvia
africana-lutea L.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
Drosanthemum
candens (Haw.) Schwantes
Mesembryanthemum
vanrensburgii (L.Bolus) Klak NT
Ruschia
macowanii (L.Bolus) Schwantes
RHAMNACEAE
Phylica
ericoides L.
THYMELAEACEAE
Passerina
cf. rigida Wikstr.

Division: Anthophyta
Class: Monocotyledones

ASPHODELACEAE
Trachyandra
ciliata (L.f.) Kunth LC
divaricata (Jacq.) Kunth
POACEAE
Cynodon
dactylon (L.) Pers.
Sporobolus
virginicus (L.) Kunth
Stenotaphrum
secundatum (Walter) Kuntze

Total named species:	**29**
Total genera:	**27**
Total families:	**15**
Total red data species:	**1**
Total introduced species:	**1**

COMMUNITY BK2: PRIMARY DUNES

Division: Anthophyta

Class: Dicotyledones

Total named species: 23
Total genera: 22
Total families: 14
Total red data species: 1
Total introduced species: 1

AIZOACEAE
Tetragonia
decumbens Mill.
ASTERACEAE
Arctotheca
populifolia (P.J.Bergius) Norl.
Chrysanthemoides
monilifera (L.) Norl.
Cineraria
cf. geifolia (L.) L.
Cotula
cf. turbinata L.
Helichrysum
cf. patulum (L.) D.Don.
Metalasia
cf. muricata (L.) D.Don.
Senecio
elegans L.
cf. maritimus L.
CARYOPHYLLACEAE
Silene
crassifolia L.
CRASSULACEAE
Crassula
cf. glomerata P.J.Bergius
FABACEAE
Psoralea
repens L. NT
GENTIANACEAE
Chironia
baccifera L.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
MYRICACEAE
Morella
cordifolia (L.) Killick
RHAMNACEAE
Phylica
ericoides L.
SCROPHULARIACEAE
Lyperia
lychnidea (L.) Druce
THYMELAEACEAE
Passerina
cf. paleacea Wikstr.

Division: Anthophyta
Class: Monocotyledones

ASPHODELACEAE
Trachyandra
divaricata (Jacq.) Kunth
CYPERACEAE
Isolepis
antarctica (L.) Roem. & Schult.
POACEAE
Ehrharta
villosa Schult.f. var. villosa
Sporobolus
virginicus (L.) Kunth

COMMUNITY BK3: FOREDUNES

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
  Tetragonia
    decumbens Mill.
ASTERACEAE
  Arctotheca
    calendula (L.) Levyns
  Chrysanthemoides
    monilifera (L.) Norl.
  Chrysocoma
    cf. coma-aurea L.
  Cotula
    turbinata L.
  Felicia
    tenella (L.) Nees subsp. longifolia (DC.) Grau
  Helichrysum
    crispum (L.) D.Don.
    cf. patulum (L.) D.Don.
  Metalasia
    cf. muricata (L.) D.Don.
  Senecio
    cf. arenarius Thunb.
    elegans L.
  Ursinia
    cf. tenuifolia (L.) Poir.
CARYOPHYLLACEAE
  Silene
    crassifolia L.
CRASSULACEAE
  Crassula
    cf. glomerata P.J.Bergius
FABACEAE
  Psoralea
    repens L. NT
GENTIANACEAE
  Chironia
    baccifera L.
GERANIACEAE
  Pelargonium
    capitatum (L.) L'Hér.
MESEMBRYANTHEMACEAE
  Carpobrotus
    acinaciformis (L.) L.Bolus LC
  Mesembryanthemum
    canaliculatum Haw.
  Ruschia
    macowanii (L.Bolus) Schwantes
MYRICACEAE
  Morella
    cordifolia (L.) Killick
RHAMNACEAE
  Phylica
    ericoides L.
SCROPHULARIACEAE
  Lyperia
    lychnidea (L.) Druce
SOLANACEAE
  Solanum
    africanum Mill. LC

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
  Brunsvigia
    orientalis (L.) Aiton ex Eckl.
ASPHODELACEAE
  Trachyandra
    divaricata (Jacq.) Kunth
CYPERACEAE
  Ficinia
    cf. lateralis (Vahl) Kunth
    nodosa (Rottb.) Goetgh.
  Isolepis
    cf. antarctica (L.) Roem. & Schult.
HYACINTHACEAE
  Albuca
    juncifolia Baker
POACEAE
  Ehrharta
    villosa Schult.f. var. villosa

Total named species:	**34**
Total genera:	**31**
Total families:	**18**
Total red data species:	**1**
Total introduced species:	**1**

COMMUNITY BK4: TRANSVERSE DUNES

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
- Rhus
  - glauca Thunb.
  - laevigata L.f.

ASTERACEAE
- Chrysanthemoides
  - monilifera (L.) Norl.
- Chrysocoma
  - cf. coma-aurea L.
- Helichrysum
  - crispum (L.) D.Don.
  - niveum (L.) Less.
- Metalasia
  - cf. muricata (L.) D.Don.
- Senecio
  - arniciflorus DC.
  - burchellii DC.
  - elegans L.

CAMPANULACEAE
- Wahlenbergia
  - tenella (L.f.) Lammers

FABACEAE
- Aspalathus
  - cf. forbesii Harv.

MESEMBRYANTHEMACEAE
- Carpobrotus
  - acinaciformis (L.) L.Bolus LC

MYRICACEAE
- Morella
  - cordifolia (L.) Killick
  - quercifolia (L.) Killick

POLYGALACEAE
- Muraltia
  - satureioides DC.

THYMELAEACEAE
- Passerina
  - cf. paleacea Wikstr.

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
- Ficinia
  - lateralis (Vahl) Kunth
- Isolepis
  - cf. antarctica (L.) Roem. & Schult.

POACEAE
- Ehrharta
  - villosa Schult.f.
- Pentaschistis
  - calcicola H P Linder
- Tribolium
  - hispidum (Thunb.) Desv.

RESTIONACEAE
- Ischyrolepis
  - eleocharis (Nees ex Mast.) H.P.Linder

Total named species:	**25**
Total genera:	**20**
Total families:	**11**
Total red data species:	**0**
Total introduced species:	**1**

COMMUNITY BK5: DWARF COASTAL THICKET

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
Pharnaceum
thunbergii Adamson
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
glauca Thunb.
APIACEAE
Capnophyllum
cf. africanum (L.) Gaertn. NT
APOCYNACEAE
Cynanchum
cf. africanum (L.) Hoffmanns.
ASTERACEAE
Cineraria
cf. geifolia (L.) L.
Cotula
turbinata L.
Dimorphotheca
pluvialis (L.) Moench
Felicia
amoena (Sch.Bip.) Levyns subsp. latifolia Grau
Helichrysum
cf. cochleariforme DC. NT
cf. dasyanthum (Willd.) Sweet
pandurifolium Schrank
patulum (L.) D.Don.
Metalasia
muricata (L.) D.Don.
Senecio
cf. arenarius Thunb.
elegans L.
Vellereophyton
dealbatum (Thunb.) Hilliard
CARYOPHYLLACEAE
Silene
bellidioides Sond.
CELASTRACEAE
Cassine
peragua L.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
CRASSULACEAE
Crassula
expansa Dryand. subsp. filicaulis (Haw.) Tölken
EBENACEAE
Euclea
racemosa Murray
FABACEAE
Indigofera
brachystachya (DC.) E.Mey.
Otholobium
bracteolatum (Eckl. & Zeyh.) C.H.Stirt.
GENTIANACEAE
Chironia
baccifera L.
LAMIACEAE
Salvia
africana-lutea L.
MESEMBRYANTHEMACEAE
Carpobrotus
cf. acinaciformis (L.) L.Bolus LC
Jordaaniella
dubia (Haw.) H.E.K.Hartmann LC
Ruschia
macowanii (L.Bolus) Schwantes
PLUMBAGINACEAE
Limonium
scabrum (Thunb.) Kuntze
POLYGONACEAE
Rumex
cf. acetosella L. subsp. angiocarpus (Murb.) Murb.
RHAMNACEAE
Phylica
ericoides L.
RUBIACEAE
Anthospermum
prostratum Sond.
Galium
tomentosum Thunb.
RUTACEAE
Agathosma
serpyllacea Licht. ex Roem. & Schult. LC
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme
SCROPHULARIACEAE
Chaenostoma
hispidum (Thunb.) Druce
Dischisma
ciliatum (P.J.Bergius) Choisy subsp. erinoides (L.f.)
Roessler
Zaluzianskya
villosa F.W.Schmidt
THYMELAEACEAE
Passerina
cf. paleacea Wikstr.
cf. rigida Wikstr.
ZYGOPHYLLACEAE
Roepera
flexuosum Eckl. & Zeyh.
fuscata Van Zyl VU

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Brunsvigia
cf. orientalis (L.) Aiton ex Eckl.
Haemanthus
cf. coccineus L.
ASPARAGACEAE
Asparagus
aethiopicus L.
CYPERACEAE
Ficinia
ramosissima Kunth
HAEMODORACEAE
Wachendorfia
paniculata Burm.
IRIDACEAE
Chasmanthe
cf. aethiopica (L.) N.E.Br.
ORCHIDACEAE
Satyrium
carneum (Dryand.) Sims NT
POACEAE
Ehrharta
calycina Sm.
villosa Schult.f.

COMMUNITY BK5: DWARF COASTAL THICKET (contd.)

Tribolium
hispidum (Thunb.) Desv.
RESTIONACEAE
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder

Total named species:	**54**
Total genera:	**47**
Total families:	**30**
Total red data species:	**4**
Total introduced species:	**0**

BANTAMSKLIP – COMMUNITY BK6: THICKET ON CALCAREOUS SAND

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
- Pharnaceum
  - thunbergii Adamson
- Tetragonia
  - fruticosa L.

ANACARDIACEAE
- Rhus
  - glauca Thunb.
  - laevigata L.f.
  - lucida L.

APIACEAE
- Arctopus
  - echinatus L.
- Torilis
  - arvensis (Huds.) Link

APOCYNACEAE
- Carissa
  - bispinosa (L.) Desf. ex Brenan
- Cynanchum
  - obtusifolium L.f.

ASTERACEAE
- Athanasia
  - cf. dentata (L.) L.
- Chrysanthemoides
  - monilifera (L.) Norl.
- Cineraria
  - geifolia (L.) L.
- Cotula
  - cf. turbinata L.
- Helichrysum
  - dasyanthum (Willd.) Sweet
  - cf. pandurifolium Schrank
  - patulum (L.) D.Don.
- Metalasia
  - cf. densa (Lam.) Karis
- Senecio
  - elegans L.
  - halimifolius L.

CELASTRACEAE
- Cassine
  - peragua L.
- Gymnosporia
  - buxifolia (L.) Szyszyl.
- Pterocelastrus
  - tricuspidatus (Lam.) Sond. LC
- Putterlickia
  - pyracantha (L.) Szyszyl.

CRASSULACEAE
- Crassula
  - dichotoma L.
  - expansa Dryand. subsp. filicaulis (Haw.) Tölken

EBENACEAE
- Euclea
  - racemosa Murray

FABACEAE
- Aspalathus
  - cf. hispida Thunb.
- Lessertia
  - frutescens (L.) Goldblatt & J.C.Manning
- Otholobium
  - bracteolatum (Eckl. & Zeyh.) C.H.Stirt.

GENTIANACEAE
- Chironia
  - baccifera L.

GERANIACEAE
- Geranium
  - incanum Burm.f.
- Pelargonium
  - alchemilloides (L.) L'Hér.

LAMIACEAE
- Salvia
  - africana-lutea L.

LAURACEAE
- Cassytha
  - cf. ciliolata Nees

MALVACEAE
- Hermannia
  - trifoliata L. LC

MESEMBRYANTHEMACEAE
- Carpobrotus
  - acinaciformis (L.) L.Bolus LC

MYRSINACEAE
- Myrsine
  - africana L.

OLEACEAE
- Chionanthus
  - foveolatus (E.Mey.) Stearn
- Olea
  - exasperata Jacq.

POLYGALACEAE
- Muraltia
  - cf. satureioides DC.
- Nylandtia
  - spinosa (L.) Dumort.
- Polygala
  - garcinii DC.
  - myrtifolia L.

PROTEACEAE
- Leucadendron
  - coniferum (L.) Meisn VU

RANUNCULACEAE
- Knowltonia
  - vesicatoria (L.f.) Sims

RUBIACEAE
- Anthospermum
  - cf. aethiopicum L.

RUTACEAE
- Agathosma
  - cerefolium (Vent.) Bartl. & H.L.Wendl. LC

SANTALACEAE
- Osyris
  - compressa (P.J.Bergius) A.DC.
- Thesium
  - subnudum Sond.

SAPOTACEAE
- Sideroxylon
  - inerme L. subsp. inerme

SCROPHULARIACEAE
- Chaenostoma
  - cf. hispidum (Thunb.) Druce
- Dischisma
  - cf. ciliatum (P.J.Bergius) Choisy
- Nemesia
  - affinis Benth.
- Zaluzianskya
  - villosa F.W.Schmidt

THYMELAEACEAE
- Passerina
  - corymbosa Eckl. ex C.H.Wright
  - paleacea Wikstr.
- Struthiola
  - striata Lam.

BANTAMSKLIP – COMMUNITY BK6: THICKET ON CALCAREOUS SAND (contd.)

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Brunsvigia
cf. orientalis (L.) Aiton ex Eckl.
Haemanthus
coccineus L.
ASPARAGACEAE
Asparagus
aethiopicus L.
asparagoides (L.) Druce
ASPHODELACEAE
Trachyandra
revoluta (L.) Kunth
CYPERACEAE
Ficinia
ramosissima Kunth
secunda (Vahl) Kunth
Hellmuthia
membranacea (Thunb.) R.Haynes & K.Lye
Isolepis
cf. antarctica (L.) Roem. & Schult.
HYACINTHACEAE
Albuca
juncifolia Baker
IRIDACEAE
Chasmanthe
aethiopica (L.) N.E.Br.
Moraea
cf. bulbillifera (G.J.Lewis) Goldblatt
fugax (D.Delaroche) Jacq.
tripetala (L.f.) Ker Gawl.
Romulea
dichotoma (Thunb.) Baker
ORCHIDACEAE
Bonatea
speciosa (L.f.) Willd. var. speciosa LC
Satyrium
carneum (Dryand.) Sims NT
POACEAE
Cymbopogon
marginatus (Steud.) Stapf ex Burtt Davy
Ehrharta
calycina Sm.
villosa Schult.f.
Tribolium
hispidum (Thunb.) Desv.
RESTIONACEAE
Elegia
microcarpa (Kunth) Pillans
Hypodiscus
procurrens Esterh. E
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder
Thamnochortus
cf. erectus (Thunb.) Mast.

Total named species:	**84**
Total genera:	**71**
Total families:	**35**
Total red data species:	**3**
Total introduced species:	**1**

COMMUNITY BK7: FOREST ON LIMESTONE

Division: Pteridophyta

ASPLENIACEAE
- Asplenium
  - adiantum-nigrum L.

PTERIDACEAE
- Adiantum
  - aethiopicum L.
- Cheilanthes
  - cf. capensis (Thunb.) Sw.

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
- Rhus
  - lucida L.

APOCYNACEAE
- Carissa
  - bispinosa (L.) Desf. ex Brenan
- Cynanchum
  - cf. obtusifolium L.f.

CELASTRACEAE
- Gymnosporia
  - buxifolia (L.) Szyszyl.
- Lauridia
  - tetragona (L.f.) R.H.Archer
- Maytenus
  - procumbens (L.f.) Loes.

CELTIDACEAE
- Celtis
  - africana Burm.f.

CUCURBITACEAE
- Kedrostis
  - nana (Lam.) Cogn.

MYRSINACEAE
- Myrsine
  - africana L.

OLEACEAE
- Chionanthus
  - foveolatus (E.Mey.) Stearn

RANUNCULACEAE
- Knowltonia
  - vesicatoria (L.f.) Sims

SAPOTACEAE
- Sideroxylon
  - inerme L. subsp. inerme

SCROPHULARIACEAE
- Chaenostoma
  - hispidum (Thunb.) Druce

URTICACEAE
- Droguetia
  - iners (Forssk.) Schweinf.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
- Haemanthus
  - cf. coccineus L.

ARACEAE
- Zantedeschia
  - aethiopica (L.) Spreng.

ASPARAGACEAE
- Asparagus
  - aethiopicus L.
  - scandens Thunb.

CYPERACEAE
- Schoenoxiphium
  - cf. lanceum (Thunb.) Kuk.

IRIDACEAE
- Chasmanthe
  - cf. aethiopica (L.) N.E.Br.

POACEAE
- Ehrharta
  - erecta Lam.
- Stipa
  - dregeana Steud.

Total named species:	**25**
Total genera:	**24**
Total families:	**19**
Total red data species:	**0**
Total introduced species:	**0**

COMMUNITY BK8: FYNBOS ON DEEP CALCAREOUS SAND OVER LIMESTONE

Division: Anthophyta
Class: Dicotyledones

APOCYNACEAE
- Astephanus
  - triflorus (L.f.) Schult.

ASTERACEAE
- Athanasia
  - quinquedentata Thunb.
- Chrysanthemoides
  - monilifera (L.) Norl.
- Disparago
  - cf. ericoides (P.J.Bergius) Gaertn.
- Gazania
  - cf. krebsiana Less.
- Helichrysum
  - cf. cochleariforme DC. NT
  - cf. dasyanthum (Willd.) Sweet
  - niveum (L.) Less.
  - retortum (L.) Willd.
- Metalasia
  - cf. brevifolia (Lam.) Levyns
  - densa (Lam.) Karis
- Oedera
  - capensis (L.) Druce
- Othonna
  - filicaulis Jacq.
- Senecio
  - cf. arenarius Thunb.
  - arniciflorus DC.
  - elegans L.
- Vellereophyton
  - dealbatum (Thunb.) Hilliard

CAMPANULACEAE
- Wahlenbergia
  - calcarea (Adamson) Lammers
  - tenella (L.f.) Lammers

CELASTRACEAE
- Cassine
  - peragua L.
- Pterocelastrus
  - tricuspidatus (Lam.) Sond. LC

CRASSULACEAE
- Crassula
  - dichotoma L.
  - expansa Dryand. subsp. expansa
  - subulata L. var. subulata

EBENACEAE
- Euclea
  - racemosa Murray

ERICACEAE
- Erica
  - coccinea L.

FABACEAE
- Lessertia
  - miniata T.M.Salter
- Otholobium
  - bracteolatum (Eckl. & Zeyh.) C.H.Stirt.

GENTIANACEAE
- Chironia
  - baccifera L.

GERANIACEAE
- Pelargonium
  - betulinum (L.) L'Hér.
  - myrrhifolium (L.) L'Hér.

MALVACEAE
- Hermannia
  - trifoliata L. LC

MESEMBRYANTHEMACEAE
- Carpobrotus
  - cf. acinaciformis (L.) L.Bolus LC
- Drosanthemum
  - intermedium (L.Bolus) L.Bolus
- Lampranthus
  - fergusoniae (L.Bolus) L.Bolus VU

MYRICACEAE
- Morella
  - quercifolia (L.) Killick

OLEACEAE
- Olea
  - exasperata Jacq.

POLYGALACEAE
- Muraltia
  - satureioides DC.

RHAMNACEAE
- Phylica
  - dodii N.E. Br.
  - ericoides L.

RUBIACEAE
- Anthospermum
  - spathulatum Spreng.

RUTACEAE
- Agathosma
  - cerefolium (Vent.) Bartl. & H.L.Wendl. LC
  - dielsiana Schltr. ex Dümmer LC
  - geniculata Pillans NT
- Diosma
  - awilana I.Williams VU

SANTALACEAE
- Osyris
  - compressa (P.J.Bergius) A.DC.
- Thesium
  - aggregatum A.W.Hill

SCROPHULARIACEAE
- Jamesbrittenia
  - albomarginata Hilliard
- Manulea
  - caledonica Hilliard NT
- Nemesia
  - cf. affinis Benth.
- Selago
  - polystachya L.
  - scabrida Thunb.
- Zaluzianskya
  - capensis (L.) Walp.
  - villosa F.W.Schmidt

THYMELAEACEAE
- Passerina
  - rigida Wikstr.

Division: Anthophyta
Class: Monocotyledones

ASPARAGACEAE
- Asparagus
  - stipulaceus Lam. NT

CYPERACEAE
- Ficinia
  - bulbosa (L.) Nees
  - ramosissima Kunth

COMMUNITY BK8: FYNBOS ON DEEP CALCAREOUS SAND OVER LIMESTONE (contd.)

Tetraria
brachyphylla Levyns NT
exilis Levyns DD
HYACINTHACEAE
Albuca
juncifolia Baker
IRIDACEAE
Aristea
africana (L.) Hoffmanns.
Moraea
tripetala (L.f.) Ker Gawl.
ORCHIDACEAE
Satyrium
carneum (Dryand.) Sims NT
cf. ligulatum Lindl.
POACEAE
Aristida
cf. junciformis Trin. & Rupr.
Hyparrhenia
hirta (L.) Stapf
Koeleria
capensis (Steud.) Nees
Pentaschistis
cf. calcicola H P Linder
Stipagrostis
cf. zeyheri (Nees) De Winter
Tribolium
hispidum (Thunb.) Desv.
RESTIONACEAE
Calopsis
fruticosa (Mast.) H.P.Linder
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder

Total named species:	**73**
Total genera:	**55**
Total families:	**28**
Total red data species:	**8**
Total introduced species:	**0**

COMMUNITY BK9A: FYNBOS ON COASTAL LIMESTONE

Division: Anthophyta

Class: Dicotyledones

ASTERACEAE
- Chrysanthemoides
  - monilifera (L.) Norl.
- Chrysocoma
  - coma-aurea L.
- Cotula
  - cf. turbinata L.
- Felicia
  - tenella (L.) Nees subsp. longifolia (DC.) Grau
- Helichrysum
  - cf. dasyanthum (Willd.) Sweet
  - cf. patulum (L.) D.Don.
  - cf. retortum (L.) Willd.
- Metalasia
  - cf. muricata (L.) D.Don.
- Nidorella
  - cf. auriculata DC.
- Senecio
  - cf. arenarius Thunb.
  - arniciflorus DC.
  - pillansii Levyns Th
- Ursinia
  - tenuifolia (L.) Poir.

CAMPANULACEAE
- Lobelia
  - comosa L.

CARYOPHYLLACEAE
- Herniaria
  - capensis Bartl.

CONVOLVULACEAE
- Falkia
  - repens L.f.

CRASSULACEAE
- Crassula
  - cf. glomerata P.J.Bergius

EBENACEAE
- Euclea
  - racemosa Murray

FABACEAE
- Aspalathus
  - forbesii Harv.
- Otholobium
  - bracteolatum (Eckl. & Zeyh.) C.H.Stirt.
- Psoralea
  - repens L. NT

GERANIACEAE
- Pelargonium
  - capitatum (L.) L'Hér.
  - grossularioides (L.) L'Hér.

LINACEAE
- Linum
  - africanum L.

MESEMBRYANTHEMACEAE
- Carpobrotus
  - cf. acinaciformis (L.) L.Bolus LC
- Mesembryanthemum
  - canaliculatum Haw.

MYRICACEAE
- Morella
  - cordifolia (L.) Killick

POLYGALACEAE
- Muraltia
  - satureioides DC.

RHAMNACEAE
- Phylica
  - ericoides L.

Division: Anthophyta

Class: Monocotyledones

ASPHODELACEAE
- Trachyandra
  - divaricata (Jacq.) Kunth

CYPERACEAE
- Ficinia
  - nodosa (Rottb.) Goetgh.
- Hellmuthia
  - membranacea (Thunb.) R.Haynes & K.Lye
- Schoenus
  - nigricans L.

IRIDACEAE
- Aristea
  - africana (L.) Hoffmanns.

JUNCACEAE
- Juncus
  - kraussii Hochst. subsp. kraussii LC

ORCHIDACEAE
- Satyrium
  - carneum (Dryand.) Sims NT
  - ligulatum Lindl.

POACEAE
- Ehrharta
  - villosa Schult.f. var. villosa
- Imperata
  - cylindrica (L.) Raeuschel
- Merxmuellera
  - cincta (Nees) Conert
- Pentaschistis
  - cf. calcicola H P Linder
- Stenotaphrum
  - secundatum (Walter) Kuntze

RESTIONACEAE
- Elegia
  - tectorum (L.f.) Raf.
- Ischyrolepis
  - eleocharis (Nees ex Mast.) H.P.Linder

Total named species:	**44**
Total genera:	**38**
Total families:	**20**
Total red data species:	**3**
Total introduced species:	**0**

COMMUNITY BK9B: FYNBOS ON COASTAL LIMESTONE

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
- Rhus
  - glauca Thunb.
  - laevigata L.f.

APIACEAE
- Arctopus
  - cf. echinatus L.

ASTERACEAE
- Arctotheca
  - calendula (L.) Levyns
- Disparago
  - cf. anomala Schltr. ex Levyns
- Gazania
  - cf. krebsiana Less.
- Helichrysum
  - cochleariforme DC. NT
  - cf. dasyanthum (Willd.) Sweet
- Metalasia
  - cf. brevifolia (Lam.) Levyns
  - densa (Lam.) Karis
- Senecio
  - arniciflorus DC.
  - pillansii Levyns Th
  - triqueter DC.
- Syncarpha
  - argyropsis (DC.) B.Nord.
- Vellereophyton
  - dealbatum (Thunb.) Hilliard

CAMPANULACEAE
- Wahlenbergia
  - calcarea (Adamson) Lammers

CELASTRACEAE
- Pterocelastrus
  - tricuspidatus (Lam.) Sond. LC

CONVOLVULACEAE
- Falkia
  - repens L.f.

CRASSULACEAE
- Crassula
  - expansa Dryand. subsp. expansa
  - subulata L. var. subulata

EBENACEAE
- Euclea
  - racemosa Murray

ERICACEAE
- Erica
  - coccinea L.

FABACEAE
- Indigofera
  - brachystachya (DC.) E.Mey.
- Lessertia
  - miniata T.M.Salter
- Otholobium
  - bracteolatum (Eckl. & Zeyh.) C.H.Stirt.

GENTIANACEAE
- Sebaea
  - aurea (L.f.) Sm.

GERANIACEAE
- Pelargonium
  - betulinum (L.) L'Hér.
  - myrrhifolium (L.) L'Hér.

LAURACEAE
- Cassytha
  - cf. ciliolata Nees

MALVACEAE
- Hermannia
  - trifoliata L. LC

MESEMBRYANTHEMACEAE
- Drosanthemum
  - intermedium (L.Bolus) L.Bolus
- Lampranthus
  - fergusoniae (L.Bolus) L.Bolus VU

MYRICACEAE
- Morella
  - quercifolia (L.) Killick

PLUMBAGINACEAE
- Limonium
  - cf. scabrum (Thunb.) Kuntze

POLYGALACEAE
- Muraltia
  - satureioides DC.

POLYGONACEAE
- Rumex
  - cordatus Poir.

RHAMNACEAE
- Phylica
  - ericoides L.

RUBIACEAE
- Anthospermum
  - cf. aethiopicum L.

RUTACEAE
- Agathosma
  - dielsiana Schltr. ex Dümmer LC

SCROPHULARIACEAE
- Chaenostoma
  - subspicatum Benth.
- Selago
  - diffusa Thunb. VU
- Zaluzianskya
  - capensis (L.) Walp.

THYMELAEACEAE
- Passerina
  - cf. rigida Wikstr.
- Struthiola
  - dodecandra (L.) Druce

Division: Anthophyta

Class: Monocotyledones

AMARYLLIDACEAE
- Brunsvigia
  - cf. orientalis (L.) Aiton ex Eckl.

ASPARAGACEAE
- Asparagus
  - stipulaceus Lam. NT

CYPERACEAE
- Ficinia
  - ramosissima Kunth
- Tetraria
  - exilis Levyns DD

HAEMODORACEAE
- Wachendorfia
  - cf. paniculata Burm.

HYACINTHACEAE
- Albuca
  - juncifolia Baker

COMMUNITY BK9B: FYNBOS ON COASTAL LIMESTONE (contd.)

IRIDACEAE
- Aristea
  - africana (L.) Hoffmanns.
- Ferraria
  - crispa Burm.
- Moraea
  - tripetala (L.f.) Ker Gawl.

ORCHIDACEAE
- Satyrium
  - carneum (Dryand.) Sims NT
  - ligulatum Lindl.

POACEAE
- Cymbopogon
  - marginatus (Steud.) Stapf ex Burtt Davy
- Pentaschistis
  - calcicola H P Linder

RESTIONACEAE
- Calopsis
  - fruticosa (Mast.) H.P.Linder
- Elegia
  - microcarpa (Kunth) Pillans
- Thamnochortus
  - fraternus Pillans NT

Total named species:	**60**
Total genera:	**52**
Total families:	**33**
Total red data species:	**7**
Total introduced species:	**0**

COMMUNITY BK9C: FYNBOS ON COASTAL LIMESTONE

Division: Anthophyta

Class: Dicotyledones

ASTERACEAE
  Chrysanthemoides
    monilifera (L.) Norl.
  Gnaphalium
    pauciflorum DC.
  Helichrysum
    cf. dasyanthum (Willd.) Sweet
    retortum (L.) Willd.
  Metalasia
    brevifolia (Lam.) Levyns
    cf. muricata (L.) D.Don.
  Senecio
    cf. arenarius Thunb.
    arniciflorus DC.
    elegans L.
    pillansii Levyns Th
  Ursinia
    tenuifolia (L.) Poir.
  Vellereophyton
    dealbatum (Thunb.) Hilliard
CAMPANULACEAE
  Wahlenbergia
    tenella (L.f.) Lammers
CRASSULACEAE
  Crassula
    cf. glomerata P.J.Bergius
ERICACEAE
  Erica
    coccinea L.
FABACEAE
  Lessertia
    cf. miniata T.M.Salter
  Psoralea
    repens L. NT
GENTIANACEAE
  Chironia
    baccifera L.
LINACEAE
  Linum
    africanum L.
MESEMBRYANTHEMACEAE
  Carpobrotus
    acinaciformis (L.) L.Bolus LC
MYRICACEAE
  Morella
    cordifolia (L.) Killick
    quercifolia (L.) Killick
POLYGALACEAE
  Muraltia
    satureioides DC.
THYMELAEACEAE
  Passerina
    cf. rigida Wikstr.

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
  Isolepis
    cf. antarctica (L.) Roem. & Schult.
  Tetraria
    cuspidata (Rottb.) C.B.Clarke
ORCHIDACEAE
  Corycium
    cf. orobanchoides (L.f.) Sw. LC
  Disa
    densiflora (Lindl.) Bolus
  Satyrium
    carneum (Dryand.) Sims NT
POACEAE
  Pentaschistis
    pallida (Thunb.) H.P.Linder LC
  Sporobolus
    cf. virginicus (L.) Kunth
RESTIONACEAE
  Ischyrolepis
    eleocharis (Nees ex Mast.) H.P.Linder
  Restio
    triticeus Rottb.

Total named species:	**34**
Total genera:	**28**
Total families:	**15**
Total red data species:	**3**
Total introduced species:	**0**

COMMUNITY BK10: FYNBOS ON INLAND LIMESTONE

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
Rhus
glauca Thunb.
laevigata L.f.
lucida L.
APOCYNACEAE
Carissa
bispinosa (L.) Desf. ex Brenan
ASTERACEAE
Berkheya
cf. coriacea Harv.
Dimorphotheca
nudicaulis (L.) DC. var. nudicaulis
Felicia
aethiopica (Burm.f.) Adamson & T.M.Salter subsp. aethiopica
Gazania
pectinata (Thunb.) Hartweg
Haplocarpha
lanata (Thunb.) Less.
Helichrysum
patulum (L.) D.Don.
Metalasia
cf. densa (Lam.) Karis
umbelliformis P.O.Karis V
Oedera
imbricata Lam.
Othonna
quinquedentata DC.
Senecio
arenarius Thunb.
Syncarpha
cf. paniculata (L.) B.Nord.
BRASSICACEAE
Erucastrum
strigosum (Thunb.) O.E.Schulz
CAMPANULACEAE
Wahlenbergia
thunbergii (Schult.) B.Nord.
CELASTRACEAE
Cassine
peragua L.
EBENACEAE
Euclea
racemosa Murray
ERICACEAE
Erica
calcareophila E.G.H.Oliv. VU
nudiflora L.
occulta E.G.H.Oliv. VU
propinqua Guthrie & Bolus
FABACEAE
Amphithalea
biovulata (Bolus) Granby LC
cf. ericifolia (L.) Eckl. & Zeyh. subsp. ericifolia
Aspalathus
ciliaris L.
hispida Thunb.
sericea P.J. Bergius LC
Indigofera
brachystachya (DC.) E.Mey.
GERANIACEAE
Pelargonium
betulinum (L.) L'Hér.
LAURACEAE
Cassytha
ciliolata Nees
MALVACEAE
Hermannia
trifoliata L. LC
MESEMBRYANTHEMACEAE
Lampranthus
ceriseus (L.Bolus) L.Bolus VU
MYRICACEAE
Morella
quercifolia (L.) Killick
OLEACEAE
Olea
capensis L. subsp. capensis
exasperata Jacq.
OROBANCHACEAE
Hyobanche
sanguinea L.
POLYGALACEAE
Muraltia
divaricata Eckl. & Zeyh.
Polygala
meridionalis Levyns
myrtifolia L.
PROTEACEAE
Leucadendron
meridianum I.Williams LC
Leucospermum
patersonii E.Phillips VU
Mimetes
saxatilis E.Phillips EN
Protea
obtusifolia H.Buek. ex. Meisn. NT
RANUNCULACEAE
Knowltonia
vesicatoria (L.f.) Sims subsp. humilis H.Rasmussen
RHAMNACEAE
Phylica
humilis Sond.
disticha Eckl. & Zeyh.
dodii N.E. Br.
ROSACEAE
Cliffortia
falcata L.f.
ilicifolia L.
RUBIACEAE
Anthospermum
aethiopicum L.
spathulatum Spreng.
RUTACEAE
Agathosma
cerefolium (Vent.) Bartl. & H.L.Wendl. LC
haelkraalensis P.A.Bean MS E
Diosma
awilana I.Williams VU
haelkraalensis I.Williams EN
SANTALACEAE
Osyris
speciosa (A.W.Hill) J.C.Manning & Goldblatt VU
SCROPHULARIACEAE
Chaenostoma
hispidum (Thunb.) Druce
subspicatum Benth.
Jamesbrittenia
calciphila Hilliard Th
Manulea
cf. crassifolia Benth.
Selago
setulosa Rolfe

COMMUNITY BK10: FYNBOS ON INLAND LIMESTONE (contd.)

THYMELAEACEAE
  Gnidia
    juniperifolia Lam.
  Passerina
    corymbosa Eckl. ex C.H.Wright
    truncata (Meisn.) Bredenkamp & A.E.van Wyk
  Struthiola
    striata Lam.

Division: Anthophyta
Class: Monocotyledones

ASPARAGACEAE
  Asparagus
    rubicundus P.J.Bergius
CYPERACEAE
  Ficinia
    filiformis (Lam.) Schrad.
    lateralis (Vahl) Kunth
    cf. nodosa (Rottb.) Goetgh.
    praemorsa Nees
  Tetraria
    compacta Levyns DD
    cuspidata (Rottb.) C.B.Clarke
IRIDACEAE
  Gladiolus
    variegatus (G.J.Lewis) Goldblatt & J.C.Manning VU
  Ixia
    polystachya L.
  Moraea
    tripetala (L.f.) Ker Gawl.
ORCHIDACEAE
  Satyrium
    carneum (Dryand.) Sims NT
POACEAE
  Cymbopogon
    cf. marginatus (Steud.) Stapf ex Burtt Davy
  Pentaschistis
    calcicola H P Linder
    curvifolia (Schrad.) Stapf
  Pseudopentameris
    macrantha (Schrad.) Conert
RESTIONACEAE
  Elegia
    equisetacea (Mast.) Mast.
    juncea L.
    cf. microcarpa (Kunth) Pillans
  Hypodiscus
    rigidus Mast.
    willdenowia (Nees) Mast.
  Ischyrolepis
    leptoclados (Mast.) H.P.Linder
  Thamnochortus
    fraternus Pillans NT

Total named species:	**90**
Total genera:	**63**
Total families:	**32**
Total red data species:	**15**
Total introduced species:	**0**

COMMUNITY BK11: FYNBOS ON SANDSTONE

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
Rhus
lucida L.
ARALIACEAE
Centella
difformis (Eckl. & Zeyh.) Adamson
ASTERACEAE
Edmondia
sesamoides (L.) Hilliard
Phaenocoma
prolifera (L.) D.Don.
Syncarpha
gnaphaloides (L.) DC.
BRASSICACEAE
Heliophila
pusilla L.f.
BRUNIACEAE
Berzelia
cf. lanuginosa (L.) Brongn.
Brunia
laevis Thunb.
Staavia
radiata Dahl
CAMPANULACEAE
Lobelia
chamaepitys Lam.
CRASSULACEAE
Crassula
fascicularis Lam.
ERICACEAE
Erica
cerinthoides L.
glabella Thunb.
imbricata L.
plukenetii L.
FABACEAE
Amphithalea
biovulata (Bolus) Granby LC
Indigofera
cytisoides (L.) L.
GENTIANACEAE
Sebaea
aurea (L.f.) Sm.
GERANIACEAE
Pelargonium
myrrhifolium (L.) L'Hér. var. coriandrifolium
LAURACEAE
Cassytha
ciliolata Nees
MALVACEAE
Hermannia
trifoliata L. LC
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
PENAEACEAE
Penaea
mucronata L.
POLYGALACEAE
Muraltia
rubeacea Eckl. & Zeyh.
PROTEACEAE
Aulax
pallasia Stapf NT
Leucadendron
xanthoconus (Kuntze) K.Schum. LC
Leucospermum
cordifolium (Salisb. ex Knight) Fourc. NT
heterophyllum (Thunb.) Rourke EN
truncatulum (Salisb. ex Knight) Rourke NT
Mimetes
cucullatus (L.) R.Br. LC
Protea
compacta R.Br. NT
longifolia Andrews VU
Serruria
elongata (P.J.Bergius) R.Br. NT
fasciflora Salisb. ex Knight NT
nervosa Meisn. NT
Spatalla
curvifolia Salisb. ex Knight NT
RHAMNACEAE
Phylica
disticha Eckl. & Zeyh.
ROSACEAE
Cliffortia
stricta Weim.
RUBIACEAE
Anthospermum
cf. aethiopicum L.
spathulatum Spreng.
RUTACEAE
Adenandra
viscida Eckl. & Zeyh.
SANTALACEAE
Osyris
compressa (P.J.Bergius) A.DC.
THYMELAEACEAE
Gnidia
tenella (Meisn.) Meisn.
Passerina
corymbosa Eckl. ex C.H.Wright
Struthiola
dodecandra (L.) Druce

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
Schoenus
nigricans L.
Tetraria
bromoides (Lam.) Pfeiffer
thermalis (L.) C.B.Clarke
IRIDACEAE
Gladiolus
bullatus Thunb. ex G.J.Lewis
debilis Ker Gawl.
Tritoniopsis
burchellii (N.E.Br.) Goldblatt
POACEAE
Cymbopogon
cf. marginatus (Steud.) Stapf ex Burtt Davy
Festuca
cf. scabra Vahl
Themeda
cf. triandra Forssk.
RESTIONACEAE
Calopsis
pulchra Esterh.
Elegia
cf. cuspidata Mast.

stipularis Mast.

COMMUNITY BK11: FYNBOS ON SANDSTONE (contd.)

Hypodiscus
  aristatus (Thunb.) Mast.
Mastersiella
  digitata (Thunb.) Gilg-Ben.
Restio
  cf. bolusii Pillans
  triticeus Rottb.
Thamnochortus
  cf. pellucidus Pillans VU

Total named species:	**63**
Total genera:	**50**
Total families:	**27**
Total red data species:	**11**
Total introduced species:	**0**

COMMUNITY BK12: FYNBOS ON ACID SAND

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
Rhus
lucida L.
ASTERACEAE
Corymbium
africanum L.
Dimorphotheca
cf. nudicaulis (L.) DC.
Edmondia
sesamoides (L.) Hilliard
Metalasia
brevifolia (Lam.) Levyns
Oedera
imbricata Lam.
Osteospermum
sp. 2 G & M
Phaenocoma
prolifera (L.) D.Don.
Senecio
hastifolius (L.f.) Less.
Trichogyne
repens (L.) Anderb.
BRUNIACEAE
Berzelia
abrotanoides (L.) Brongn.
lanuginosa (L.) Brongn.
Staavia
radiata Dahl
CRASSULACEAE
Crassula
cf. nudicaulis L.
DROSERACEAE
Drosera
trinervia Spreng.
ERICACEAE
Erica
axillaris Thunb.
cf. corifolia L.
cf. imbricata L.
interrupta (N.E.Br.) E.G.H.Oliv.
sessiliflora L.f.
tenella Andrews
FABACEAE
Amphithalea
biovulata (Bolus) Granby LC
Aspalathus
sericea P.J. Bergius LC
cf. tylodes Eckl. & Zeyh. EN
Indigofera
angustifolia L.
Xiphotheca
cf. fruticosa (L.) A.L. Schutte & B.-E. van Wyk VU
LAURACEAE
Cassytha
ciliolata Nees
MESEMBRYANTHEMACEAE
Carpobrotus
cf. acinaciformis (L.) L.Bolus LC
MYRICACEAE
Morella
quercifolia (L.) Killick
OXALIDACEAE
Oxalis
cf. commutata Sond.
PENAEACEAE
Penaea
mucronata L.
POLYGALACEAE
Polygala
refracta DC.
PROTEACEAE
Leucadendron
salignum P.J.Bergius LC
xanthoconus (Kuntze) K.Schum. LC
Leucospermum
pedunculatum Klotzsch LC
Mimetes
cucullatus (L.) R.Br. LC
Protea
compacta R.Br. NT
cynaroides (L.) L. LC
cf. obtusifolia H.Buek. ex. Meisn. NT
susannae E.Phillips NT
Serruria
nervosa Meisn. NT
Spatalla
ericoides E.Phillips EN
RHAMNACEAE
Phylica
amoena Pillans EN
disticha Eckl. & Zeyh.
Trichocephalus
stipularis (L.) Brongn.
ROSACEAE
Cliffortia
stricta Weim.
RUBIACEAE
Anthospermum
cf. aethiopicum L.
RUTACEAE
Adenandra
viscida Eckl. & Zeyh.
Agathosma
bifida (Jacq.) Bart. & H.L.Wendl.
Euchaetis
burchellii Dummer
SANTALACEAE
Osyris
speciosa (A.W.Hill) J.C.Manning & Goldblatt VU
SCHIZAEACEAE
Schizaea
pectinata (L.) Sw.
SCROPHULARIACEAE
Microdon
dubius (L.) Hilliard
THYMELAEACEAE
Gnidia
pinifolia L.
tenella (Meisn.) Meisn.
Struthiola
striata Lam.
ZYGOPHYLLACEAE
Roepera
fulva L.

COMMUNITY BK12: FYNBOS ON ACID SAND (contd.)

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
Ficinia
oligantha (Steud.) J.Raynal
zeyheri Boeck.
Tetraria
compar (L.) Lestib. LC
flexuosa (Thunb.) C.B.Clarke
HAEMODORACEAE
Wachendorfia
paniculata Burm.
IRIDACEAE
Aristea
cf. glauca Klatt
Ixia
odorata Ker Gawl.
Moraea
neglecta G.J.Lewis
cf. tripetala (L.f.) Ker Gawl.
ORCHIDACEAE
Disa
bracteata Sw.
POACEAE
Merxmuellera
cincta (Nees) Conert
Tribolium
uniolae (L.f.) Renvoize
RESTIONACEAE
Calopsis
hyalina (Mast.) H.P.Linder
pulchra Esterh.
Elegia
hookeriana (Mast.) Pillans
juncea L.
nuda (Rottb.) Kunth
stipularis Mast.
Mastersiella
digitata (Thunb.) Gilg-Ben.
Restio
egregius Hochst.
Staberoha
banksii Pillans
Thamnochortus
pellucidus Pillans VU

Total named species:	**80**
Total genera:	**59**
Total families:	**29**
Total red data species:	**10**
Total introduced species:	**0**

COMMUNITY BK13: HYGRIC FYNBOS

Division: Pteridophyta

BLECHNACEAE
Blechnum
cf. capense Burm.f.
DENNSTAEDTIACEAE
Pteridium
aquilinum (L.) Kuhn subsp. aquilinum
FABACEAE
Indigofera
alopecuroides (Burm.f.) DC. var. alopecuroides
RHAMNACEAE
Phylica
axillaris Lam. var. maritima Pillans

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
Rhus
lucida L.
tomentosa L.
ASTERACEAE
Gazania
pectinata (Thunb.) Hartweg
Helichrysum
cymosum (L.) D.Don.
patulum (L.) D.Don.
Metalasia
cf. densa (Lam.) Karis
Senecio
hastifolius (L.f.) Less.
BRUNIACEAE
Berzelia
lanuginosa (L.) Brongn.
DROSERACEAE
Drosera
trinervia Spreng.
ERICACEAE
Erica
coccinea L. subsp. coccinea
colorans Andrews
cf. curviflora L.
parviflora L.
sessiliflora L.f.
FABACEAE
Psoralea
restioides Eckl. & Zeyh. LC
GENTIANACEAE
Chironia
jasminoides L.
GRUBBIACEAE
Grubbia
cf. rosmarinifolia P.J.Bergius
LAURACEAE
Cassytha
ciliolata Nees
MYRICACEAE
Morella
quercifolia (L.) Killick
serrata (Lam.) Killick
OLEACEAE
Olea
capensis L. subsp. capensis
PENAEACEAE
Penaea
mucronata L.
PROTEACEAE
Leucadendron
cf. xanthoconus (Kuntze) K.Schum. LC
Mimetes
cucullatus (L.) R.Br. LC
ROSACEAE
Cliffortia
ferruginea L.f.
strobilifera L.
RUBIACEAE
Anthospermum
cf. aethiopicum L.

Division: Anthophyta
Class: Monocotyledones

ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
CYPERACEAE
Ficinia
capitella (Thunb.) Nees
Neesenbeckia
punctoria (Vahl) Levyns
POACEAE
Merxmuellera
cincta (Nees) Conert
rufa (Nees) Conert
RESTIONACEAE
Restio
bifidus Thunb.

Total named species: **38**
Total genera: **28**
Total families: **22**
Total red data species: **0**
Total introduced species: **0**

COMMUNITY BK14A: FYNBOS ON NEUTRAL TO ACID SAND

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
Rhus
glauca Thunb.
lucida L.
rosmarinifolia Vahl
ASTERACEAE
Arctotis
acaulis L.
Cotula
turbinata L.
Edmondia
sesamoides (L.) Hilliard
Gazania
pectinata (Thunb.) Hartweg
Helichrysum
cf. cymosum (L.) D.Don.
Hippia
frutescens (L.) L.
Metalasia
brevifolia (Lam.) Levyns
Plecostachys
serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
Senecio
cf. arenarius Thunb.
BRUNIACEAE
Berzelia
abrotanoides (L.) Brongn.
Brunia
laevis Thunb.
Staavia
radiata Dahl
CAMPANULACEAE
Lobelia
coronopifolia L.
Roella
arenaria Schltr. VU
Wahlenbergia
longifolia (A.DC.) Lammers
CELASTRACEAE
Maytenus
oleoides (Lam.) Loes.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
DIPSACACEAE
Scabiosa
incisa Mill.
DROSERACEAE
Drosera
trinervia Spreng.
ERICACEAE
Erica
discolor Andrews
glabella Thunb.
imbricata L.
mammosa L.
plukenetii L. subsp. lineata (Benth.) E.G.H.Oliv. &
cf. pulchella Houtt.
sessiliflora L.f.
FABACEAE
Amphithalea
biovulata (Bolus) Granby LC
Aspalathus
callosa L.
Podalyria
myrtillifolia
GERANIACEAE
Pelargonium
capitatum (L.) L'Hér.
elegans (Andrews) Willd.
triste (L.) L'Hér.
MALVACEAE
Hermannia
joubertiana Harv.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
Jordaaniella
maritima (L.Bolus) Van Jaarsv.
Lampranthus
tenuifolius (L.) N.E.Br. CR
OLEACEAE
Olea
capensis L. subsp. capensis
OXALIDACEAE
Oxalis
eckloniana C.Presl
PENAEACEAE
Penaea
mucronata L.
POLYGALACEAE
Muraltia
ericoides (Burm.f.) Steud.
Polygala
uncinata E.Mey. ex Meisn.
PROTEACEAE
Aulax
umbellata (Thunb.) R.Br. NT
Leucadendron
coniferum (L.) Meisn VU
linifolium (Jacq.) R.Br. VU
xanthoconus (Kuntze) K.Schum. LC
Leucospermum
hypophyllocarpodendron (L.) Druce subsp.
hypophyllocarpodendron VU
Mimetes
cucullatus (L.) R.Br. LC
Protea
compacta R.Br. NT
obtusifolia H.Buek. ex. Meisn. NT
susannae E.Phillips NT
RANUNCULACEAE
Knowltonia
vesicatoria (L.f.) Sims subsp. humilis H.Rasmussen
RHAMNACEAE
Phylica
disticha Eckl. & Zeyh.
imberbis P.J.Bergius
ROSACEAE
Cliffortia
falcata L.f.
RUBIACEAE
Anthospermum
cf. aethiopicum L.
RUTACEAE
Euchaetis
burchellii Dummer
SANTALACEAE
Osyris
speciosa (A.W.Hill) J.C.Manning & Goldblatt VU
SCROPHULARIACEAE
Dischisma
ciliatum (P.J.Bergius) Choisy
Hebenstretia
dentata L.

COMMUNITY BK14A: FYNBOS ON NEUTRAL TO ACID SAND (contd.)

THYMELAEACEAE
Gnidia
juniperifolia Lam.
pinifolia L.
Passerina
corymbosa Eckl. ex C.H.Wright
Struthiola
cf. striata Lam.
VISCACEAE
Viscum
capense L.f.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Haemanthus
cf. coccineus L.
sanguineus Jacq.
ASPARAGACEAE
Asparagus
rubicundus P.J.Bergius
ASPHODELACEAE
Trachyandra
revoluta (L.) Kunth
CYPERACEAE
Ficinia
ramosissima Kunth
Schoenus
nigricans L.
Tetraria
capillacea (Thunb.) C.B.Clarke
compar (L.) Lestib. LC
HYACINTHACEAE
Albuca
cooperi Baker
IRIDACEAE
Aristea
cf. glauca Klatt
Bobartia
longicyma J.B.Gillett subsp. magna J.B.Gillett ex Strid
Gladiolus
bullatus Thunb. ex G.J.Lewis
martleyi L.Bolus LC
cf. variegatus (G.J.Lewis) Goldblatt & J.C.Manning
VU
Hesperantha
falcata (L.f.) Ker Gawl.
Moraea
cf. neglecta G.J.Lewis
tripetala (L.f.) Ker Gawl.
Watsonia
stenosiphon L.Bolus
LANARIACEAE
Lanaria
lanata (L.) T.Durand & Schinz
ORCHIDACEAE
Disa
bracteata Sw.
Satyrium
carneum (Dryand.) Sims NT
POACEAE
Cymbopogon
cf. marginatus (Steud.) Stapf ex Burtt Davy
Ehrharta
calycina Sm.
Festuca
scabra Vahl
Merxmuellera
rufa (Nees) Conert
Pentaschistis
aristidoides (Thunb.) Stapf
Pseudopentameris
macrantha (Schrad.) Conert
Stenotaphrum
secundatum (Walter) Kuntze
Tribolium
uniolae (L.f.) Renvoize
RESTIONACEAE
Elegia
cuspidata Mast.
filacea Mast.
cf. microcarpa (Kunth) Pillans
nuda (Rottb.) Kunth
cf. stipularis Mast.
Hypodiscus
aristatus (Thunb.) Mast.
Mastersiella
digitata (Thunb.) Gilg-Ben.
Restio
bifurcus Nees ex Mast.
bolusii Pillans
triticeus Rottb.
Staberoha
banksii Pillans
Thamnochortus
erectus (Thunb.) Mast.
fruticosus P.J.Bergius
guthrieae Pillans LC
Willdenowia
cf. teres Thunb.

Total named species:	**114**
Total genera:	**84**
Total families:	**37**
Total red data species:	**12**
Total introduced species:	**0**

COMMUNITY BK14B: LEUCADENDRON CONIFERUM FYNBOS ON NEUTRAL TO ACID SAND

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
- Rhus
  - laevigata L.f.
  - lucida L.

ASTERACEAE
- Metalasia
  - cf. densa (Lam.) Karis
- Plecostachys
  - serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
- Senecio
  - burchellii DC.
  - elegans L.
- Seriphium
  - plumosum L.

BRUNIACEAE
- Berzelia
  - lanuginosa (L.) Brongn.

CAMPANULACEAE
- Lobelia
  - coronopifolia L.

ERICACEAE
- Erica
  - interrupta (N.E.Br.) E.G.H.Oliv.
  - plukenetii L.

GENTIANACEAE
- Chironia
  - baccifera L.

GERANIACEAE
- Pelargonium
  - capitatum (L.) L'Hér.
  - elegans (Andrews) Willd.
  - myrrhifolium (L.) L'Hér.

LAURACEAE
- Cassytha
  - cf. ciliolata Nees

MESEMBRYANTHEMACEAE
- Carpobrotus
  - acinaciformis (L.) L.Bolus LC

MYRICACEAE
- Morella
  - quercifolia (L.) Killick

OXALIDACEAE
- Oxalis
  - purpurea L.

PROTEACEAE
- Leucadendron
  - coniferum (L.) Meisn VU
  - linifolium (Jacq.) R.Br. VU
- Leucospermum
  - hypophyllocarpodendron (L.) Druce subsp. hypophyllocarpodendron VU
  - pedunculatum Klotzsch LC
- Mimetes
  - cucullatus (L.) R.Br. LC
- Protea
  - susannae E.Phillips NT
- Spatalla
  - ericoides E.Phillips EN

RHAMNACEAE
- Phylica
  - disticha Eckl. & Zeyh.

ROSACEAE
- Cliffortia
  - falcata L.f.

RUBIACEAE
- Anthospermum
  - prostratum Sond.
  - cf. spathulatum Spreng.

THYMELAEACEAE
- Gnidia
  - juniperifolia Lam.
- Passerina
  - corymbosa Eckl. ex C.H.Wright

Division: Anthophyta
Class: Monocotyledones

ASPARAGACEAE
- Asparagus
  - cf. capensis L.

COLCHICACEAE
- Colchicum
  - eucomoides (Jacq.) J.C.Manning & Vinnersten

CYPERACEAE
- Ficinia
  - deusta (P.J.Bergius) Levyns
  - filiformis (Lam.) Schrad.

POACEAE
- Merxmuellera
  - cincta (Nees) Conert
- Pentaschistis
  - pallida (Thunb.) H.P.Linder LC
- Stenotaphrum
  - secundatum (Walter) Kuntze

RESTIONACEAE
- Elegia
  - nuda (Rottb.) Kunth
- Ischyrolepis
  - eleocharis (Nees ex Mast.) H.P.Linder
- Restio
  - triticeus Rottb.

Total named species:	**43**
Total genera:	**34**
Total families:	**22**
Total red data species:	**5**
Total introduced species:	**0**

COMMUNITY BK15: WETLAND

Division: Anthophyta

Class: Dicotyledones

ARALIACEAE
Hydrocotyle
cf. verticillata Thunb.
BRUNIACEAE
Berzelia
lanuginosa (L.) Brongn.
HALORAGACEAE
Laurembergia
repens P.J.Bergius subsp. brachypoda (Hiern) Oberm.
LAURACEAE
Cassytha
cf. ciliolata Nees

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
Carpha
glomerata (Thunb.) Nees
Isolepis
rubicunda Kunth
Neesenbeckia
punctoria (Vahl) Levyns
Tetraria
ligulata C.B.Clarke
POACEAE
Merxmuellera
cincta (Nees) Conert
RESTIONACEAE
Elegia
tectorum (L.f.) Raf.
Platycaulos
compressus (Rottb.) H.P.Linder

Total named species:	**11**
Total genera:	**11**
Total families:	**7**
Total red data species:	**0**
Total introduced species:	**0**

COMMUNITY BK16A: GROOT HAGELKRAAL RIVER

Division: Pteridophyta

BLECHNACEAE
Blechnum
capense Burm.f.
THELYPTERIDACEAE
Thelypteris
confluens (Thunb.) C.V.Morton

Division: Anthophyta
Class: Dicotyledones

ASTERACEAE
Helichrysum
cf. cymosum (L.) D.Don.
FABACEAE
Psoralea
cf. aphylla L.
GRUBBIACEAE
Grubbia
cf. rosmarinifolia P.J.Bergius
LAURACEAE
Cassytha
ciliolata Nees
MYRICACEAE
Morella
serrata (Lam.) Killick
ROSACEAE
Cliffortia
ferruginea L.f.
cf. strobilifera L.

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
Carpha
glomerata (Thunb.) Nees
Cyperus
sphaerospermus Schrad.
Neesenbeckia
punctoria (Vahl) Levyns
HAEMODORACEAE
Wachendorfia
cf. thyrsiflora Burm. LC
PRIONIACEAE
Prionium
serratum (L.f.) Drege ex E.Mey. De
RESTIONACEAE
Platycaulos
compressus (Rottb.) H.P.Linder

Total named species:	**15**
Total genera:	**14**
Total families:	**12**
Total red data species:	**1**
Total introduced species:	**0**

COMMUNITY BK16B: GROOT HAGELKRAAL RIVER

Division: Pteridophyta

PTERIDACEAE
Pteris
dentata Forssk.

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
Rhus
lucida L.
ASTERACEAE
Othonna
cf. quinquedentata DC.
Ursinia
dentata (L.) Poir.
BRUNIACEAE
Berzelia
lanuginosa (L.) Brongn.
CAMPANULACEAE
Monopsis
lutea (L.) Urb.
ROSACEAE
Cliffortia
ferruginea L.f.
THYMELAEACEAE
Struthiola
dodecandra (L.) Druce

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
Cyperus
sphaerospermus Schrad.
Schoenus
nigricans L.
RESTIONACEAE
Elegia
fistulosa Kunth
Platycaulos
compressus (Rottb.) H.P.Linder

Total named species:	**12**
Total genera:	**12**
Total families:	**9**
Total red data species:	**0**
Total introduced species:	**0**

COMMUNITY BK16C: GROOT HAGELKRAAL RIVER

Division: Pteridophyta

PTERIDACEAE
Pteris
dentata Forssk.

Division: Anthophyta
Class: Dicotyledones

ASTERACEAE
Hippia
frutescens (L.) L.
MYRICACEAE
Morella
serrata (Lam.) Killick
THYMELAEACEAE
Passerina
corymbosa Eckl. ex C.H.Wright

Division: Anthophyta
Class: Monocotyledones

ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
RESTIONACEAE
Calopsis
paniculata (Rottb.) Desv.

Total named species:	**7**
Total genera:	**7**
Total families:	**7**
Total red data species:	**0**
Total introduced species:	**0**

COMMUNITY BK16D: GROOT HAGELKRAAL RIVER

Division: Anthophyta

Class: Dicotyledones

ASTERACEAE
Conyza
cf. scabrida DC.
Plecostachys
serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
Senecio
halimifolius L.
LAURACEAE
Cassytha
ciliolata Nees
RUBIACEAE
Anthospermum
cf. aethiopicum L.

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
Fuirena
hirsuta (P.J.Bergius) P.L.Forbes
Isolepis
costata A.Rich.
RESTIONACEAE
Elegia
asperiflora (Nees) Kunth
TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species:	**9**
Total genera:	**9**
Total families:	**6**
Total red data species:	**0**
Total introduced species:	**0**

COMMUNITY BK16E: GROOT HAGELKRAAL RIVER

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
Rhus
laevigata L.f.
lucida L.
APIACEAE
Berula
erecta (Huds.) Coville subsp. thunbergii (DC.) B.L.Burtt
ARALIACEAE
Centella
cf. asiatica (L.) Urban
ASTERACEAE
Athanasia
dentata (L.) L.
Helichrysum
cymosum (L.) D.Don.
Hippia
cf. frutescens (L.) L.
Metalasia
cf. muricata (L.) D.Don.
Plecostachys
serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
Pulicaria
scabra (Thunb.) Druce
Senecio
halimifolius L.
CAMPANULACEAE
Lobelia
anceps L.f.
FABACEAE
Psoralea
pinnata L.
GERANIACEAE
Pelargonium
grossularioides (L.) L'Hér.
LAMIACEAE
Leonotis
leonurus (L.) R.Br.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
edulis (L.) L.Bolus
MYRSINACEAE
Myrsine
africana L.
RANUNCULACEAE
Ranunculus
multifidus Forssk.
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme
THYMELAEACEAE
Passerina
corymbosa Eckl. ex C.H.Wright

Division: Anthophyta
Class: Monocotyledones

ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
CYPERACEAE
Carex
glomerabilis Krecz
Cyperus
congestus Vahl
Eleocharis
limosa (Schrad.) Schult.
Ficinia
capitella (Thunb.) Nees
indica (Lam.) Pfeiffer
nodosa (Rottb.) Goetgh.
Isolepis
cf. antarctica (L.) Roem. & Schult.
cf. prolifera R.Br.
rubicunda Kunth
HYACINTHACEAE
Albuca
juncifolia Baker
IRIDACEAE
Chasmanthe
aethiopica (L.) N.E.Br.
Gladiolus
carneus D.Delaroche
POACEAE
Cynodon
dactylon (L.) Pers.
Helictotrichon
hirtulum (Steud.) Schweick.
Melica
racemosa Thunb.
Merxmuellera
cincta (Nees) Conert
Phragmites
australis (Cav.) Trin. ex Steud.
Stenotaphrum
secundatum (Walter) Kuntze
RESTIONACEAE
Calopsis
paniculata (Rottb.) Desv.
Elegia
cf. tectorum (L.f.) Raf.
TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species:	**48**
Total genera:	**42**
Total families:	**23**
Total red data species:	**0**
Total introduced species:	**2**

APPENDIX 4.2.2. PLANT SPECIES RECORDED FROM BANTAMSKLIP: COMPOSITE LIST

NT: Near Threatened; R: Rare, VU: vulnerable EN: Endangered, CR: Critically Endangered

LC: Least Concern; DD: Data Deficient; De: Declining

Report produced by the SaSFLORA database: data (C) Coastec; database design and structures (C) Reuben Roberts 1998-2008

Division: Pteridophyta

ASPLENIACEAE
Asplenium
adiantum-nigrum L.
BLECHNACEAE
Blechnum
capense Burm.f.
DENNSTAEDTIACEAE
Pteridium
aquilinum (L.) Kuhn subsp. aquilinum
PTERIDACEAE
Adiantum
aethiopicum L.
Cheilanthes
capensis (Thunb.) Sw.
Pteris
dentata Forssk.
SCHIZAEACEAE
Schizaea
pectinata (L.) Sw.
THELYPTERIDACEAE
Thelypteris
confluens (Thunb.) C.V.Morton

Division: Anthophyta
Class: Dicotyledones

AIZOACEAE
Pharnaceum
thunbergii Adamson
Tetragonia
decumbens Mill.
fruticosa L.
AMARANTHACEAE
Bassia
diffusa (Thunb.) Kuntze
ANACARDIACEAE
Rhus
glauca Thunb.
laevigata L.f.
lucida L.
rosmarinifolia Vahl
tomentosa L.
APIACEAE
Arctopus
echinatus L.
Berula
erecta (Huds.) Coville subsp. thunbergii (DC.) B.L.Burtt
Capnophyllum
africanum (L.) Gaertn. NT
Torilis
arvensis (Huds.) Link
APOCYNACEAE
Astephanus
triflorus (L.f.) Schult.
Carissa
bispinosa (L.) Desf. ex Brenan
Cynanchum
africanum (L.) Hoffmanns.
obtusifolium L.f.
ARALIACEAE
Centella
asiatica (L.) Urban
difformis (Eckl. & Zeyh.) Adamson
Hydrocotyle
verticillata Thunb.

ASTERACEAE
Arctotheca
calendula (L.) Levyns
populifolia (P.J.Bergius) Norl.
Arctotis
acaulis L.
Athanasia
dentata (L.) L.
quinquedentata Thunb.
Berkheya
coriacea Harv.
Chrysanthemoides
monilifera (L.) Norl.
Chrysocoma
coma-aurea L.
Cineraria
geifolia (L.) L.
Conyza
scabrida DC.
Corymbium
africanum L.
Cotula
turbinata L.
Dimorphotheca
nudicaulis (L.) DC. var. nudicaulis
pluvialis (L.) Moench
Disparago
anomala Schltr. ex Levyns
ericoides (P.J.Bergius) Gaertn.
Edmondia
sesamoides (L.) Hilliard
Felicia
aethiopica (Burm.f.) Adamson & T.M.Salter subsp. aethiopica
amoena (Sch.Bip.) Levyns subsp. latifolia Grau
tenella (L.) Nees subsp. longifolia (DC.) Grau
Gazania
krebsiana Less.
pectinata (Thunb.) Hartweg
Gnaphalium
pauciflorum DC.
Haplocarpha
lanata (Thunb.) Less.
Helichrysum
cochleariforme DC. NT
crispum (L.) D.Don.
cymosum (L.) D.Don.
dasyanthum (Willd.) Sweet
niveum (L.) Less.
pandurifolium Schrank
patulum (L.) D.Don.
retortum (L.) Willd.
Hippia
frutescens (L.) L.
Metalasia
brevifolia (Lam.) Levyns
densa (Lam.) Karis
muricata (L.) D.Don.
umbelliformis P.O.Karis V
Nidorella
auriculata DC.
Oedera
capensis (L.) Druce
imbricata Lam.
Osteospermum
sp. 2 G & M
Othonna
filicaulis Jacq.
quinquedentata DC.

Phaenocoma
prolifera (L.) D.Don.
Plecostachys
serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
Pulicaria
scabra (Thunb.) Druce
Senecio
arenarius Thunb.
arniciflorus DC.
burchellii DC.
elegans L.
halimifolius L.
hastifolius (L.f.) Less.
maritimus L.
pillansii Levyns Th
triqueter DC.
Seriphium
plumosum L.
Syncarpha
argyropsis (DC.) B.Nord.
gnaphaloides (L.) DC.
paniculata (L.) B.Nord.
Trichogyne
repens (L.) Anderb.
Ursinia
dentata (L.) Poir.
tenuifolia (L.) Poir.
Vellereophyton
dealbatum (Thunb.) Hilliard
BRASSICACEAE
Erucastrum
strigosum (Thunb.) O.E.Schulz
Heliophila
pusilla L.f.
BRUNIACEAE
Berzelia
abrotanoides (L.) Brongn.
lanuginosa (L.) Brongn.
Brunia
laevis Thunb.
Staavia
radiata Dahl
CAMPANULACEAE
Lobelia
anceps L.f.
chamaepitys Lam.
comosa L.
coronopifolia L.
Monopsis
lutea (L.) Urb.
Roella
arenaria Schltr. VU
Wahlenbergia
calcarea (Adamson) Lammers
longifolia (A.DC.) Lammers
tenella (L.f.) Lammers
thunbergii (Schult.) B.Nord.
CARYOPHYLLACEAE
Herniaria
capensis Bartl.
Silene
bellidioides Sond.
crassifolia L.
CELASTRACEAE
Cassine
peragua L.
Gymnosporia
buxifolia (L.) Szyszyl.
Lauridia
tetragona (L.f.) R.H.Archer
Maytenus
oleoides (Lam.) Loes.
procumbens (L.f.) Loes.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Putterlickia
pyracantha (L.) Szyszyl.
CELTIDACEAE
Celtis
africana Burm.f.
CONVOLVULACEAE
Falkia
repens L.f.
CRASSULACEAE
Crassula
dichotoma L.
expansa Dryand. subsp. expansa
expansa Dryand. subsp. filicaulis (Haw.) Tölken
fascicularis Lam.
glomerata P.J.Bergius
nudicaulis L.
subulata L. var. subulata
CUCURBITACEAE
Kedrostis
nana (Lam.) Cogn.
DIPSACACEAE
Scabiosa
incisa Mill.
DROSERACEAE
Drosera
trinervia Spreng.
EBENACEAE
Euclea
racemosa Murray
ERICACEAE
Erica
axillaris Thunb.
calcareophila E.G.H.Oliv. VU
cerinthoides L.
coccinea L. subsp. coccinea
colorans Andrews
corifolia L.
curviflora L.
discolor Andrews
glabella Thunb.
imbricata L.
interrupta (N.E.Br.) E.G.H.Oliv.
mammosa L.
nudiflora L.
occulta E.G.H.Oliv. VU
parviflora L.
plukenetii L. subsp. lineata (Benth.) E.G.H.Oliv. & I.M.Oliv.
propinqua Guthrie & Bolus
pulchella Houtt.
sessiliflora L.f.
tenella Andrews
FABACEAE
Amphithalea
biovulata (Bolus) Granby LC
ericifolia (L.) Eckl. & Zeyh. subsp. ericifolia
Aspalathus
callosa L.
ciliaris L.
forbesii Harv.
hispida Thunb.
sericea P.J. Bergius LC
tylodes Eckl. & Zeyh. EN

Indigofera
alopecuroides (Burm.f.) DC. var. alopecuroides
angustifolia L.
brachystachya (DC.) E.Mey.
cytisoides (L.) L.
Lessertia
frutescens (L.) Goldblatt & J.C.Manning
miniata T.M.Salter
Otholobium
bracteolatum (Eckl. & Zeyh.) C.H.Stirt.
Podalyria
myrtillifolia
Psoralea
aphylla L.
pinnata L.
repens L. NT
restioides Eckl. & Zeyh. LC
Xiphotheca
fruticosa (L.) A.L. Schutte & B.-E. van Wyk VU
GENTIANACEAE
Chironia
baccifera L.
jasminoides L.
Sebaea
aurea (L.f.) Sm.
GERANIACEAE
Geranium
incanum Burm.f.
Pelargonium
alchemilloides (L.) L'Hér.
betulinum (L.) L'Hér.
capitatum (L.) L'Hér.
elegans (Andrews) Willd.
grossularioides (L.) L'Hér.
myrrhifolium (L.) L'Hér. var. coriandrifolium
triste (L.) L'Hér.
GRUBBIACEAE
Grubbia
rosmarinifolia P.J.Bergius
HALORAGACEAE
Laurembergia
repens P.J.Bergius subsp. brachypoda (Hiern) Oberm.
LAMIACEAE
Leonotis
leonurus (L.) R.Br.
Salvia
africana-lutea L.
LAURACEAE
Cassytha
ciliolata Nees
LINACEAE
Linum
africanum L.
MALVACEAE
Hermannia
joubertiana Harv.
trifoliata L. LC
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
edulis (L.) L.Bolus
Drosanthemum
candens (Haw.) Schwantes
intermedium (L.Bolus) L.Bolus
Jordaaniella
dubia (Haw.) H.E.K.Hartmann LC
maritima (L.Bolus) Van Jaarsv.
Lampranthus
ceriseus (L.Bolus) L.Bolus VU
fergusoniae (L.Bolus) L.Bolus VU
tenuifolius (L.) N.E.Br. CR
Mesembryanthemum
canaliculatum Haw.
vanrensburgii (L.Bolus) Klak NT
Ruschia
macowanii (L.Bolus) Schwantes
MYRICACEAE
Morella
cordifolia (L.) Killick
quercifolia (L.) Killick
serrata (Lam.) Killick
MYRSINACEAE
Myrsine
africana L.
OLEACEAE
Chionanthus
foveolatus (E.Mey.) Stearn
Olea
capensis L. subsp. capensis
exasperata Jacq.
OROBANCHACEAE
Hyobanche
sanguinea L.
OXALIDACEAE
Oxalis
commutata Sond.
eckloniana C.Presl
purpurea L.
PENAEACEAE
Penaea
mucronata L.
PLUMBAGINACEAE
Limonium
scabrum (Thunb.) Kuntze
POLYGALACEAE
Muraltia
divaricata Eckl. & Zeyh.
ericoides (Burm.f.) Steud.
rubeacea Eckl. & Zeyh.
satureioides DC.
Nylandtia
spinosa (L.) Dumort.
Polygala
garcinii DC.
meridionalis Levyns
myrtifolia L.
refracta DC.
uncinata E.Mey. ex Meisn.
POLYGONACEAE
Rumex
acetosella L. subsp. angiocarpus (Murb.) Murb.
cordatus Poir.
PROTEACEAE
Aulax
pallasia Stapf NT
umbellata (Thunb.) R.Br. NT
Leucadendron
coniferum (L.) Meisn VU
linifolium (Jacq.) R.Br. VU
meridianum I.Williams LC
salignum P.J.Bergius LC
xanthoconus (Kuntze) K.Schum. LC
Leucospermum
cordifolium (Salisb. ex Knight) Fourc. NT
heterophyllum (Thunb.) Rourke EN
hypophyllocarpodendron (L.) Druce subsp.
hypophyllocarpodendron VU
patersonii E.Phillips VU
pedunculatum Klotzsch LC
truncatulum (Salisb. ex Knight) Rourke NT
Mimetes
cucullatus (L.) R.Br. LC
saxatilis E.Phillips EN

Protea
compacta R.Br. NT
cynaroides (L.) L. LC
longifolia Andrews VU
obtusifolia H.Buek. ex. Meisn. NT
susannae E.Phillips NT
Serruria
elongata (P.J.Bergius) R.Br. NT
fasciflora Salisb. ex Knight NT
nervosa Meisn. NT
Spatalla
curvifolia Salisb. ex Knight NT
ericoides E.Phillips EN
RANUNCULACEAE
Knowltonia
vesicatoria (L.f.) Sims subsp. humilis H.Rasmussen
Ranunculus
multifidus Forssk.
RHAMNACEAE
Phylica
amoena Pillans EN
axillaris Lam. var. maritima Pillans
disticha Eckl. & Zeyh.
dodii N.E. Br.
ericoides L.
humilis Sond.
imberbis P.J.Bergius
Trichocephalus
stipularis (L.) Brongn.
ROSACEAE
Cliffortia
falcata L.f.
ferruginea L.f.
ilicifolia L.
stricta Weim.
strobilifera L.
RUBIACEAE
Anthospermum
aethiopicum L.
prostratum Sond.
spathulatum Spreng.
Galium
tomentosum Thunb.
RUTACEAE
Adenandra
viscida Eckl. & Zeyh.
Agathosma
bifida (Jacq.) Bart. & H.L.Wendl.
cerefolium (Vent.) Bartl. & H.L.Wendl. LC
dielsiana Schltr. ex Dümmer LC
geniculata Pillans NT
haelkraalensis P.A.Bean MS E
serpyllacea Licht. ex Roem. & Schult. LC
Diosma
awilana I.Williams VU
haelkraalensis I.Williams EN
Euchaetis
burchellii Dummer
SANTALACEAE
Osyris
compressa (P.J.Bergius) A.DC.
speciosa (A.W.Hill) J.C.Manning & Goldblatt VU
Thesium
aggregatum A.W.Hill
subnudum Sond.
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme
SCROPHULARIACEAE
Chaenostoma
hispidum (Thunb.) Druce
subspicatum Benth.
Dischisma
ciliatum (P.J.Bergius) Choisy subsp. erinoides (L.f.) Roessler
Hebenstretia
dentata L.
Jamesbrittenia
albomarginata Hilliard
calciphila Hilliard Th
Lyperia
lychnidea (L.) Druce

Manulea
caledonica Hilliard NT
crassifolia Benth.
Microdon
dubius (L.) Hilliard
Nemesia
affinis Benth.
Selago
diffusa Thunb. VU
polystachya L.
scabrida Thunb.
setulosa Rolfe
Zaluzianskya
capensis (L.) Walp.
villosa F.W.Schmidt
SOLANACEAE
Solanum
africanum Mill. LC
THYMELAEACEAE
Gnidia
juniperifolia Lam.
pinifolia L.
tenella (Meisn.) Meisn.
Passerina
corymbosa Eckl. ex C.H.Wright
paleacea Wikstr.
rigida Wikstr.
truncata (Meisn.) Bredenkamp & A.E.van Wyk
Struthiola
dodecandra (L.) Druce
striata Lam.
URTICACEAE
Droguetia
iners (Forssk.) Schweinf.
VISCACEAE
Viscum
capense L.f.
ZYGOPHYLLACEAE
Roepera
flexuosum Eckl. & Zeyh.
fulva L.
fuscata Van Zyl VU

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Brunsvigia
orientalis (L.) Aiton ex Eckl.
Haemanthus
coccineus L.
sanguineus Jacq.
ARACEAE
Zantedeschia
aethiopica (L.) Spreng.

ASPARAGACEAE
Asparagus
aethiopicus L.
asparagoides (L.) Druce
capensis L.
rubicundus P.J.Bergius
scandens Thunb.
stipulaceus Lam. NT
ASPHODELACEAE
Trachyandra
ciliata (L.f.) Kunth LC
divaricata (Jacq.) Kunth
revoluta (L.) Kunth
COLCHICACEAE
Colchicum
eucomoides (Jacq.) J.C.Manning & Vinnersten
CYPERACEAE
Carex
glomerabilis Krecz
Carpha
glomerata (Thunb.) Nees
Cyperus
congestus Vahl
sphaerospermus Schrad.
Eleocharis
limosa (Schrad.) Schult.
Ficinia
bulbosa (L.) Nees
capitella (Thunb.) Nees
deusta (P.J.Bergius) Levyns
filiformis (Lam.) Schrad.
indica (Lam.) Pfeiffer
lateralis (Vahl) Kunth
nodosa (Rottb.) Goetgh.
oligantha (Steud.) J.Raynal
praemorsa Nees
ramosissima Kunth
secunda (Vahl) Kunth
zeyheri Boeck.
Fuirena
hirsuta (P.J.Bergius) P.L.Forbes
Hellmuthia
membranacea (Thunb.) R.Haynes & K.Lye
Isolepis
antarctica (L.) Roem. & Schult.
costata A.Rich.
prolifera R.Br.
rubicunda Kunth
Neesenbeckia
punctoria (Vahl) Levyns
Schoenoxiphium
lanceum (Thunb.) Kuk.
Schoenus
nigricans L.
Tetraria
brachyphylla Levyns NT
bromoides (Lam.) Pfeiffer
capillacea (Thunb.) C.B.Clarke
compacta Levyns DD
compar (L.) Lestib. LC
cuspidata (Rottb.) C.B.Clarke
exilis Levyns DD
flexuosa (Thunb.) C.B.Clarke
ligulata C.B.Clarke
thermalis (L.) C.B.Clarke
HAEMODORACEAE
Wachendorfia
paniculata Burm.
thyrsiflora Burm. LC
HYACINTHACEAE
Albuca
cooperi Baker
juncifolia Baker
IRIDACEAE
Aristea
africana (L.) Hoffmanns.
glauca Klatt
Bobartia
longicyma J.B.Gillett subsp. magna J.B.Gillett ex Strid
Chasmanthe
aethiopica (L.) N.E.Br.
Ferraria
crispa Burm.
Gladiolus
bullatus Thunb. ex G.J.Lewis
carneus D.Delaroche
debilis Ker Gawl.
martleyi L.Bolus LC
variegatus (G.J.Lewis) Goldblatt & J.C.Manning VU
Hesperantha
falcata (L.f.) Ker Gawl.
Ixia
odorata Ker Gawl.
polystachya L.
Moraea
bulbillifera (G.J.Lewis) Goldblatt
fugax (D.Delaroche) Jacq.
neglecta G.J.Lewis
tripetala (L.f.) Ker Gawl.
Romulea
dichotoma (Thunb.) Baker
Tritoniopsis
burchellii (N.E.Br.) Goldblatt
Watsonia
stenosiphon L.Bolus
JUNCACEAE
Juncus
kraussii Hochst. subsp. kraussii LC
LANARIACEAE
Lanaria
lanata (L.) T.Durand & Schinz
ORCHIDACEAE
Bonatea
speciosa (L.f.) Willd. var. speciosa LC
Corycium
orobanchoides (L.f.) Sw. LC
Disa
bracteata Sw.
densiflora (Lindl.) Bolus
Satyrium
carneum (Dryand.) Sims NT
ligulatum Lindl.
POACEAE
Aristida
junciformis Trin. & Rupr.
Cymbopogon
marginatus (Steud.) Stapf ex Burtt Davy
Cynodon
dactylon (L.) Pers.
Ehrharta
calycina Sm.
erecta Lam.
villosa Schult.f. var. villosa
Festuca
scabra Vahl
Helictotrichon
hirtulum (Steud.) Schweick.
Hyparrhenia
hirta (L.) Stapf
Imperata
cylindrica (L.) Raeuschel

Koeleria
capensis (Steud.) Nees
Melica
racemosa Thunb.
Merxmuellera
cincta (Nees) Conert
rufa (Nees) Conert
Pentaschistis
aristidoides (Thunb.) Stapf
calcicola H P Linder
curvifolia (Schrad.) Stapf
pallida (Thunb.) H.P.Linder LC
Phragmites
australis (Cav.) Trin. ex Steud.
Pseudopentameris
macrantha (Schrad.) Conert
Sporobolus
virginicus (L.) Kunth
Stenotaphrum
secundatum (Walter) Kuntze
Stipa
dregeana Steud.
Stipagrostis
zeyheri (Nees) De Winter
Themeda
triandra Forssk.
Tribolium
hispidum (Thunb.) Desv.
uniolae (L.f.) Renvoize
PRIONIACEAE
Prionium
serratum (L.f.) Drege ex E.Mey. De
RESTIONACEAE
Calopsis
fruticosa (Mast.) H.P.Linder
hyalina (Mast.) H.P.Linder
paniculata (Rottb.) Desv.
pulchra Esterh.
Elegia
asperiflora (Nees) Kunth
cuspidata Mast.
equisetacea (Mast.) Mast.
filacea Mast.
fistulosa Kunth
hookeriana (Mast.) Pillans
juncea L.
microcarpa (Kunth) Pillans
nuda (Rottb.) Kunth
stipularis Mast.
tectorum (L.f.) Raf.
Hypodiscus
aristatus (Thunb.) Mast.
procurrens Esterh. E
rigidus Mast.
willdenowia (Nees) Mast.
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder
leptoclados (Mast.) H.P.Linder
Mastersiella
digitata (Thunb.) Gilg-Ben.
Platycaulos
compressus (Rottb.) H.P.Linder
Restio
bifidus Thunb.
bifurcus Nees ex Mast.
bolusii Pillans
egregius Hochst.
triticeus Rottb.
Staberoha
banksii Pillans
Thamnochortus
erectus (Thunb.) Mast.
fraternus Pillans NT
fruticosus P.J.Bergius
guthrieae Pillans LC
pellucidus Pillans VU
Willdenowia
teres Thunb.
TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species:	**483**
Total genera:	**233**
Total families:	**78**
Total red data species:	**52**
Total introduced species:	**6**

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASPLENIACEAE	Asplenium adiantum-nigrum L.	black maidenhair, black spleenwort	Gifberg to Eurasia, Mexico	No change, cliffs and boulders						
BLECHNACEAE	Blechnum capense Burm.f.	Cape deer fern	Citrusdal to E Africa	No change, moist streambanks						
DENNSTAEDTIACEAE	Pteridium aquilinum (L.) Kuhn subsp. aquilinum		Gifberg to Europe	No change, fynbos and forest margins						
PTERIDACEAE	Adiantum aethiopicum L.	maidenhair (fern), vrouehaar (-varing)	Groot Winterhoek Mts to George and N America	No change, moist banks						
PTERIDACEAE	Cheilanthes capensis (Thunb.) Sw.		Bokkeveld Mts to Port Elizabeth, southern Africa	No change, rock outcrops in fynbos and scrub						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
SCHIZAEACEAE	Schizaea pectinata (L.) Sw.	curly grass fern, toothbrush fern	Clanwilliam to E Africa and Madagascar	No change, dry mountain slopes						
AIZOACEAE	Pharnaceum thunbergii Adamson		Stilbaai to KwaZulu-Natal	No change, coastal bush						
AIZOACEAE	Tetragonia decumbens Mill.	kinkelbossie	S Namibia to E Cape	No change, coastal dunes						
AIZOACEAE	Tetragonia fruticosa L.	kinkelbossie, kinkelklappers, kleinsaadklaapiesbrak, klimopkinkelbossie, porslein, slaaibos	Namaqualand to Clanwilliam to Port Elizabeth	No change, sandstone slopes, especially along the coast						
AMARANTHACEAE	Bassia diffusa	soutbossie	Namibia to Mozambique	No change,						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	(Thunb.) Kuntze			coastal salt marshes						
ANACARDIACEAE	Rhus glauca Thunb.	bloukoeniebos, blue kuni-bush, taaiblaar	Velddrif to Kentani	No change, mostly on dunes						
ANACARDIACEAE	Rhus laevigata L.f.	duinetaaibos, dune taaibos, koerentebos, ranktaaibos, taaibos, umhlakothi	Lambert's Bay to East London	No change, coastal flats and slopes						
ANACARDIACEAE	Rhus lucida L.	besembos, blinktaaibos, wild currant	Citrusdal to Zimbabwe	No change, sandy flats and slopes						
ANACARDIACEAE	Rhus rosmarinifolia Vahl	roosmaryntaaibos	Clanwilliam to Port Elizabeth	No change, gravelly soils, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ANACARDIACEAE	Rhus tomentosa L.	korentebos, wild currant	Clanwilliam to Zimbabwe	No change, rocky slopes						
APIACEAE	Arctopus echinatus L.	platannadoring, platdoring, pokkiesdoring	S Namaqualand and W Karoo to Grahamstown	No change, sand and granite flats and slopes						
APIACEAE	Capnophyllum africanum (L.) Gaertn.		Saldanha to Gansbaai	No change, sand dunes, **endemic**					1	
APIACEAE	Torilis arvensis (Huds.) Link	hedge parsley, wildewortel	Bokkeveld Mts to Cape Peninsula, W Karoo and E Cape to Europe	No change, flats and rocky slopes						
APOCYNACEAE	Astephanus triflorus (L.f.) Schult.	bokhoring, melkblommetjie	Namaqualand to Plettenberg Bay	No change, coastal or inland bush						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
APOCYNACEAE	Carissa bispinosa (L.) Desf. ex Brenan	isibetha-nkunzi, noemnoem, num-num	Elim to tropical Africa	No change, coastal and karroid scrub						
APOCYNACEAE	Cynanchum africanum (L.) Hoffmanns.	bobbejaantou, bokhoring, klimop, monkey rope	Namaqualand to Cape Peninsula to E Cape	No change, sandy soils, mainly coastal						
APOCYNACEAE	Cynanchum obtusifolium L.f.	melktou, monkey rope	Cape Peninsula to Mozambique	No change, coastal bush						
ARALIACEAE	Centella difformis (Eckl. & Zeyh.) Adamson		Franschhoek Mts to Potberg	No change, coastal flats and lower slopes, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Arctotheca calendula (L.) Levyns	Cape weed, gousblom	Namaqualand and Karoo to Cape Peninsula and Humansdorp	No change, coastal areas or disturbed soil						
ASTERACEAE	Arctotheca populifolia (P.J.Bergius) Norl.	sea pumpkin, seepampoen	Saldanha to Mozambique	No change, coastal dunes						
ASTERACEAE	Arctotis acaulis L.	botterblom, marigold, renostergousblom	W Karoo and Bokkeveld Plateau to Langeberg Mts	South western extension of distribution, clay, granitic flats and limestones					1	1
ASTERACEAE	Athanasia dentata (L.) L.		Cape Peninsula to Struisbaai, George to Port Elizabeth	No change, **sandy coastal**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes endemic						
ASTERACEAE	Athanasia quinquedentata Thunb.		Stanford to Port Elizabeth	No change, sandstone and limestone hills, **endemic**					1	
ASTERACEAE	Berkheya coriacea Harv.	disseldoring, witdissel	Agulhas to Albertinia	No change, **limestone endemic**					1	
ASTERACEAE	Chrysanthemoides monilifera (L.) Norl.	bietou, boetabessie, bosluisbessie, brother berry	Namaqualand to tropical Africa	No change, sandstone and limestone slopes and flats						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Chrysocoma coma-aurea L.		Cape Peninsula to Hermanus	No change, flats and lower slopes, **regional endemic**	1					
ASTERACEAE	Cineraria geifolia (L.) L.	cineraria	Cape Peninsula to S KwaZulu-Natal	No change, coastal bush						
ASTERACEAE	Corymbium africanum L.	heuningbossie, plampers	Cedarberg Mts to Grahamstown	No change, sandy flats and slopes						
ASTERACEAE	Cotula turbinata L.	batchelor buttons, ganskos	N Cedarberg Mts to Potberg	No change, sandy or disturbed areas, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Dimorphotheca nudicaulis (L.) DC. var. nudicaulis	ox-eye daisy, wildemargriet, witmargriet	Bokkeveld Escarpment to George	No change, sandstone slopes, **endemic**					1	
ASTERACEAE	Dimorphotheca pluvialis (L.) Moench	Cape (rain) daisy, ox-eye daisy, reënblommetjie, witbotterblom	S Namibia to Gouritsmond	No change, sand and clay flats and slopes						
ASTERACEAE	Disparago anomala Schltr. ex Levyns		Cape Peninsula to Potberg	No change, c**oastal sands and limestone endemic**					1	
ASTERACEAE	Disparago ericoides (P.J.Bergius) Gaertn.		Darling to Matroosberg and Gouritsmond	No change, **sandstone slopes endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Edmondia sesamoides (L.) Hilliard	everlasting, sewejaartjie, strooiblommetjie	Cedarberg Mts to Mossel Bay	No change, rocky flats and slopes, **endemic**					1	
ASTERACEAE	Felicia aethiopica (Burm.f.) Adamson & T.M.Salter subsp. aethiopica	wilde-aster, wilde-astertjie	Cedarberg Mts to KwaZulu-Natal	No change, rocky flats and slopes						
ASTERACEAE	Felicia amoena (Sch.Bip.) Levyns subsp. latifolia Grau		Cedarberg Mts to E Cape	No change, sandy slopes						
ASTERACEAE	Felicia tenella (L.) Nees subsp. longifolia (DC.) Grau	astertjie	Bokkeveld Mts to Albertinia	No change, **coastal dunes endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Gazania krebsiana Less.	botterblom, gousblom, rooigazania, rooigousblom	throughout southern Africa to Tanzania	No change, roadsides, flats or lower slopes						
ASTERACEAE	Gazania pectinata (Thunb.) Hartweg	Kaapserooigousblom	Saldanha to Potberg	No change, **Coastal flats endemic**					1	
ASTERACEAE	Gnaphalium pauciflorum DC.		Piketberg to Riversdale	Southern extension of distribution, flats and slopes, **Cape endemic**					1	
ASTERACEAE	Haplocarpha lanata (Thunb.) Less.	brandblom, brandbossie	Cape Peninsula to Swellendam	Eastern extension of distribution, sandstone slopes, **Cape**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
ASTERACEAE	Helichrysum cochleariforme DC.	duineteebossie, gold-and-silver	Aurora to Gouriqua	No change, **coastal sands endemic**					1	
ASTERACEAE	Helichrysum crispum (L.) D.Don.	Hottentotskooigoed, kooigoed	Bloubergstrand to George	No change, **coastal sands endemic**					1	
ASTERACEAE	Helichrysum cymosum (L.) D.Don.		Mamre to Mpumalanga	No change, sandy slopes in damp places						
ASTERACEAE	Helichrysum dasyanthum	kooigoed	Namaqualand to Baviaanskloof Mts	No change, sandy flats						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	(Willd.) Sweet			and slopes						
ASTERACEAE	Helichrysum niveum (L.) Less.		Saldanha to Stilbaai	No change, **coastal dunes endemic**					1	
ASTERACEAE	Helichrysum pandurifolium Schrank		Bainskloof to Kouga Mts	No change, sandy flats and slopes, Cape endemic					1	
ASTERACEAE	Helichrysum patulum (L.) D.Don.	Hottentot's bedding, Hottentotskooigoed, kooigoed	Cape Peninsula to Mossel Bay	No change, sandy flats and slopes, often coastal, **Cape endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Helichrysum retortum (L.) Willd.		Bloubergstrand to Stilbaai	No change, coastal sands and cliffs, **Cape endemic**					1	
ASTERACEAE	Hippia frutescens (L.) L.	rankals	Ceres to Storms River	No change, sandstone slopes, often near streams or marshes, **Cape endemic**					1	
ASTERACEAE	Metalasia brevifolia (Lam.) Levyns	blombossie	Bokkeveld Mts to Cape Peninsula and to Port Elizabeth	No change, sandstone flats and slopes, **Cape endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Metalasia densa (Lam.) Karis	blombos	Namaqualand to N Province	Southern extension of distribution, sandy or stony flats and slopes						1
ASTERACEAE	Metalasia muricata (L.) D.Don.	blombos, steekbos, witsteekbossie	Yzerfontein to Transkei	No change, coastal sands to 300m						
ASTERACEAE	Metalasia umbelliformis P.O.Karis		Pearly Beach to Brandfontein	No change, **limestone ridge and local endemic**				1		
ASTERACEAE	Nidorella auriculata DC.		Caledon to tropical Africa	No change, damp places						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Oedera capensis (L.) Druce		Cape Peninsula to Albertinia and Little Karoo	No change, dry stony flats and slopes, **Cape endemic**					1	
ASTERACEAE	Oedera imbricata Lam.		Yzerfontein to Grahamstown	No change, mountain slopes						
ASTERACEAE	Osteospermum sp. 2 G & M		Agulhas Peninsula	No change, **limestone hills and local endemic**				1		
ASTERACEAE	Othonna filicaulis Jacq.	bobbejaankoolklimop	S Namibia to Uniondale	No change, sandy flats and slopes						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Othonna quinquedentata DC.		Cape Peninsula to Langkloof	No change, rocky sandstone slopes, often damp places, **regional endemic**	1					
ASTERACEAE	Phaenocoma prolifera (L.) D.Don.	red everlasting, rooisewejaartjie	Ceres to Cape Peninsula to Robinson Pass	No change, sandstone slopes in fynbos, **endemic**					1	
ASTERACEAE	Plecostachys serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt	vaaltee	Langebaan to KwaZulu-Natal	No change, sandy coastal flats or damp slopes						
ASTERACEAE	Senecio arenarius	hongerblom	S Namibia and W Karoo	No change,					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	Thunb.		to De Hoop	sandy flats, **endemic**						
ASTERACEAE	Senecio arniciflorus DC.		Mamre to Agulhas	No change, sandy coastal flats and lower slopes, **endemic**					1	
ASTERACEAE	Senecio burchellii DC.	geelgifbos, Molteno disease plant	Namibia to Cape Peninsula to Port Elizabeth	No change, sandy and stony slopes						
ASTERACEAE	Senecio elegans L.	strandblommetjie, veld cineraria, wild cineraria	Saldanha to Port Elizabeth	No change, **coastal sands endemic**					1	
ASTERACEAE	Senecio halimifolius L.	tabakbos	Lambert's Bay to Hermanus	No change, **coastal sands**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
ASTERACEAE	Senecio hastifolius (L.f.) Less.		Olifants River Mts to Elim	Major southern extension of distribution, damp sandstone slopes and marshes, **endemic**					1	1
ASTERACEAE	Senecio maritimus L.	strandhongerblom	S Namaqualand to Agulhas	No change, coastal dunes and slopes						
ASTERACEAE	Senecio pillansii Levyns		Cape Peninsula to Elim	No change, **coastal slopes and regional**		1				

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
ASTERACEAE	Senecio triqueter DC.		Cape Peninsula to Ladismith and Pearly Beach	No change, rocky sandstone slopes, **endemic**					1	
ASTERACEAE	Seriphium plumosum L.	"khoi"-kooigoed, slangbos	Throughout southern Africa	No change, rocky flats and slopes						
ASTERACEAE	Syncarpha argyropsis (DC.) B.Nord.	witsewejaartjie	Rooiels to Plettenberg Bay	No change, coastal slopes, **endemic**					1	
ASTERACEAE	Syncarpha gnaphaloides (L.) DC.	vlakteebossie, vlaktetee	Cape Peninsula and Tulbagh to Outeniqua Mts	No change, sandstone slopes, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Syncarpha paniculata (L.) B.Nord.	sewejaartjie, witsewejaartjie	Gifberg to Port Elizabeth	Southern extension of distribution, coastal and lower slopes, **endemic**					1	1
ASTERACEAE	Trichogyne repens (L.) Anderb.	witnaaldebossie	Vredenburg to Mossel Bay	No change, coastal dunes and sandy flats, **endemic**					1	
ASTERACEAE	Ursinia tenuifolia (L.) Poir.		Cape Peninsula to Albertinia	No change, sandy flats and slopes, usually seasonally wet, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASTERACEAE	Vellereophyton dealbatum (Thunb.) Hilliard		Namaqualand and W Karoo to Alexandria	No change, damp sandstone slopes						
BRASSICACEAE	Erucastrum strigosum (Thunb.) O.E.Schulz		Eastern Cape	Southern extension of distribution						1
BRASSICACEAE	Heliophila pusilla L.f.		Cold Bokkeveld to De Hoop	No change, clay soils, **endemic**					1	
BRUNIACEAE	Berzelia abrotanoides (L.) Brongn.	rooibeentjies	Elandsbaai to Potberg	No change, rocky sandstone slopes, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
BRUNIACEAE	Berzelia lanuginosa (L.) Brongn.	kolkol, vleiknopbos, vleikolkol	Gifberg to Bredasdorp Mts	No change, damp sandstone slopes, seeps and streambanks, **endemic**					1	
BRUNIACEAE	Brunia laevis Thunb.	brunia, vaalstompie, vaaltol	Hottentots Holland Mts to Agulhas	No change, rocky sandstone and limestone slopes, **regional endemic**	1					
BRUNIACEAE	Staavia radiata Dahl	altydbos, altydbossie	Yzerfontein to Gouritsmond	No change, sandy flats and plateaus, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CAMPANULACEAE	Lobelia chamaepitys Lam.		Stellenbosch to Klein Swartberg and Bredasdorp	No change, sandstone slopes, **endemic**					1	
CAMPANULACEAE	Lobelia comosa L.	lobelia	Cape Peninsula to Caledon	No change, sandy coastal slopes, **endemic**					1	
CAMPANULACEAE	Lobelia coronopifolia L.	kussinglobelia, wild lobelia	Gifberg to Kleinrivier Mts	No change, sandy and stony flats and lower slopes, **endemic**					1	
CAMPANULACEAE	Roella arenaria Schltr.	prikkelstêr	Malmesbury to Bredasdorp	No change, sandy flats, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CAMPANULACEAE	Wahlenbergia calcarea (Adamson) Lammers		Pearly Beach to Stilbaai	No change, **coastal limestone endemic**					1	
CAMPANULACEAE	Wahlenbergia longifolia (A.DC.) Lammers	suikerpoppie	Hopefield to De Hoop	No change, **coastal sands and limestone endemic**					1	
CAMPANULACEAE	Wahlenbergia tenella (L.f.) Lammers		Mamre to E Cape	No change, sandy flats and slopes, often coastal						
CAMPANULACEAE	Wahlenbergia thunbergii (Schult.) B.Nord.		Western Cape	No change						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CARYOPHYLLACEAE	Herniaria capensis Bartl.		Ceres, Cape Peninsula to George, Graaff-Reinet	No change, sandy flats, usually coastal						
CARYOPHYLLACEAE	Silene bellidioides Sond.	wild tobacco, wildetabak	Tulbagh to Cape Peninsula and Port Elizabeth to Mpumalanga	No change, sandy flats and slopes						
CARYOPHYLLACEAE	Silene crassifolia L.		Saldanha Bay to Agulhas	No change, **coastal dunes endemic**					1	
CELASTRACEAE	Cassine peragua L.	bastard saffronwood, bastersaffraan, Cape saffron, ikhukhuzi, lepelhout	Bokkeveld Mountains to Cape Peninsula to Mpumalanga	No change, coastal scrub, woodland or forest margin						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CELASTRACEAE	Gymnosporia buxifolia (L.) Szyszyl.	gewonependoring, mnquqoba, stinkpendoring	widespread in southern and tropical Africa	No change, forest margins and disturbed areas						
CELASTRACEAE	Lauridia tetragona (L.f.) R.H.Archer	climbing saffron, ranksaffraan	Hermanus to N Province	No change, scrub						
CELASTRACEAE	Maytenus oleoides (Lam.) Loes.	klipkershout	Richtersveld to Cape Peninsula to Great Winterhoek Mts	No change, rocky slopes						
CELASTRACEAE	Maytenus procumbens (L.f.) Loes.	duinekokoboom, dune koko tree, umPhono-phono	De Hoop to tropical Africa	No change, coastal dune forest						
CELASTRACEAE	Pterocelastrus tricuspidatus (Lam.) Sond.	cherrywood, kershout, utwina	Velddrif to Cape Peninsula to Port Edward	No change, dune scrub or forest						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CELASTRACEAE	Putterlickia pyracantha (L.) Szyszyl.	basterpendoring, pendoring, wildegranaat	Velddrif to E Cape	No change, riverbanks or coastal scrub						
CELTIDACEAE	Celtis africana Burm.f.	white stinkwood, witstinkhout	Cape Peninsula to tropical Africa	No change, forest						
CONVOLVULACEAE	Falkia repens L.f.	oortjies	Darling to E Cape	No change, damp coastal flats and seeps						
CRASSULACEAE	Crassula dichotoma L.	geel crassula	Namaqualand to Agulhas	No change, sandy flats						
CRASSULACEAE	Crassula expansa Dryand. subsp. expansa	strepiescrassula	S Namibia to Mozambique	No change, coastal sands and limestone						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CRASSULACEAE	Crassula expansa Dryand. subsp. filicaulis (Haw.) Tölken	strepiescrassula	S Namibia to Mozambique	No change, coastal sands and limestone						
CRASSULACEAE	Crassula fascicularis Lam.		Gifberg to Langeberg Mts	Southern extension of distribution, sandstone slopes, **endemic**					1	1
CRASSULACEAE	Crassula glomerata P.J.Bergius	brakvygie	Clanwilliam to Port Elizabeth	Southern extension of distribution, sandy, often coastal flats and limestone, **endemic**					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CRASSULACEAE	Crassula nudicaulis L.	bergplakkie, skraalplakkie	Bokkeveld Mts to N Province	No change, dry stony slopes						
CRASSULACEAE	Crassula subulata L. var. subulata		Bokkeveld Mts to Port Alfred	Southern extension of distribution, dry rocky slopes						1
CUCURBITACEAE	Kedrostis nana (Lam.) Cogn.	bryony, ystervarkpatat(s)	Saldanha to KwaZulu-Natal	No change, coastal scrub						
DIPSACACEAE	Scabiosa incisa Mill.	scabious	Bokbaai to Grahamstown	No change, coastal sands, often limestone						
DROSERACEAE	Drosera trinervia Spreng.	kleinsnotrosie, small sundew	Namaqualand to Agulhas	No change, peaty sandstone						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes						
EBENACEAE	Euclea racemosa Murray	bosghwarrie, bush guarri, kersbos, sea guarri, seeghwarrie	Namaqualand to E Cape	No change, coastal scrub						
ERICACEAE	Erica axillaris Thunb.	bruinbasterheide	Cape Peninsula to Knysna	No change, mountain slopes and flats, **endemic**					1	
ERICACEAE	Erica calcareophila E.G.H.Oliv.		Pearly Beach	No change, **coastal limestone and local endemic**				1		
ERICACEAE	Erica coccinea L.	vlakteheide	Clanwilliam to George	No change, common on					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	subsp. coccinea			rocky flats and mountains, **endemic**						
ERICACEAE	Erica colorans Andrews	tregterheide	Stanford to Elim	No change, wet areas at low altitude, **local endemic**			1			
ERICACEAE	Erica corifolia L.		Malmesbury to De Hoop	No change, common on sandy flats and middle to upper slopes, **endemic**					1	
ERICACEAE	Erica curviflora L.	grietjielangkarosheide, water heath, waterbos, waterheide		South western extension of distribution,					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				sandy places on upper slopes, **endemic**						
ERICACEAE	Erica discolor Andrews		Betty's Bay to Humansdorp and Swartberg	No change, coastal flats and lower mountain slopes, **endemic**					1	
ERICACEAE	Erica glabella Thunb.		Cape Peninsula to Breede River mouth	No change, sandy flats and lower to middle slopes, **endemic**					1	
ERICACEAE	Erica imbricata L.	kêr-kêr	Gifberg to Kouga Mts	Southern extension of distribution,					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				coastal sandy flats to middle altitude, **endemic**						
ERICACEAE	Erica interrupta (N.E.Br.) E.G.H.Oliv.		Pearly Beach to Elim	No change, sandy hills and flats, **local endemic**			1			
ERICACEAE	Erica mammosa L.	ninepin heath, rooiklossieheide, spinnekopvoete	Cedarberg Mts to Bredasdorp	No change, sandy flats and lower mountain slopes, **endemic**					1	
ERICACEAE	Erica nudiflora L.		Cedarberg Mts to Witteberg and Bredasdorp	No change, coastal flats to inland high					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				altitude, **endemic**						
ERICACEAE	Erica occulta E.G.H.Oliv.		Pearly Beach	No change, **cliffs on low limestone hills and local endemic**				1		
ERICACEAE	Erica parviflora L.	bergheide	Du Toitskloof Mts to Cape Peninsula to Bredasdorp	No change, flats and slopes, often wet places, **endemic**					1	
ERICACEAE	Erica plukenetii L. subsp. lineata (Benth.) E.G.H.Oliv. & I.M.Oliv.		Namaqualand to Mossel Bay and Witteberg	No change, widespread						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ERICACEAE	Erica propinqua Guthrie & Bolus		Pearly Beach to De Hoop	No change, **coastal limestone hills endemic**					1	
ERICACEAE	Erica pulchella Houtt.		Cape Peninsula to Albertinia	No change, sandy flats and lower slopes, **endemic**					1	
ERICACEAE	Erica sessiliflora L.f.		Piketberg to Humansdorp	Southern extension of distribution, flats and mostly lower slopes, **endemic**					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ERICACEAE	Erica tenella Andrews		Houwhoek to Elim	No change, middle to upper mountain slopes, **regional endemic**	1					
FABACEAE	Amphithalea biovulata (Bolus) Granby		Kogelberg to De Hoop	No change, lowland fynbos, **endemic**					1	
FABACEAE	Amphithalea ericifolia (L.) Eckl. & Zeyh. subsp. ericifolia	persblom	Malmesbury to Albertinia	No change, mountain and lowland fynbos below 1500m, **endemic**					1	
FABACEAE	Aspalathus		Cape Peninsula to	No change,					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	callosa L.		Bredasdorp	lowland fynbos, **endemic**						
FABACEAE	Aspalathus ciliaris L.		Clanwilliam to Humansdorp	No change, lowland fynbos, **endemic**					1	
FABACEAE	Aspalathus forbesii Harv.		Cape Peninsula to Stilbaai	No change, coastal fynbos, limestone and marine sand, **endemic**					1	
FABACEAE	Aspalathus hispida Thunb.	witertjiebos	Namaqualand near Springbok, Gifberg to Alexandria	No change, fynbos scrub or coastal fynbos						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
FABACEAE	Aspalathus sericea P.J. Bergius		Hopefield to Agulhas	No change, coastal fynbos, flats, below 300m, **endemic**					1	
FABACEAE	Aspalathus tylodes Eckl. & Zeyh.		Cape Flats and Struisbaai to Albertinia	No change, coastal fynbos, **endemic**					1	
FABACEAE	Indigofera alopecuroides (Burm.f.) DC. var. alopecuroides		Stellenbosch to Humansdorp	No change, mountain and lowland fynbos						
FABACEAE	Indigofera angustifolia L.		Cape Peninsula to Riversdale	No change, lowland fynbos, endemic					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
FABACEAE	Indigofera brachystachya (DC.) E.Mey.		Cape Peninsula to Agulhas	No change, **coastal limestone fynbos and regional endemic**		1				
FABACEAE	Indigofera cytisoides (L.) L.		Cape Peninsula to Kleinrivier Mts	No change, mountain and riverine fynbos, **endemic**					1	
FABACEAE	Lessertia frutescens (L.) Goldblatt & J.C.Manning	cancer bush, kankerbos	Namaqualand and W Karoo to E Cape	No change, sandstone and shale flats and slopes						
FABACEAE	Lessertia miniata T.M.Salter		Cape Peninsula to Stilbaai	No change, coastal					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				fynbos, often limestone, **endemic**						
FABACEAE	Otholobium bracteolatum (Eckl. & Zeyh.) C.H.Stirt.	skaapbostee	Saldanha to Grahamstown	No change, coastal sandveld, limestone hills, **endemic**					1	
FABACEAE	Podalyria myrtillifolia		Tulbagh to Port Elizabeth	No change, sandstone limestone or shale flats, **endemic**					1	
FABACEAE	Psoralea repens L.	duine-ertjie	Cape Peninsula to E Cape	No change, coastal fynbos						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
FABACEAE	Psoralea restioides Eckl. & Zeyh.		Cape Peninsula to Bredasdorp	No change, mountain and lowland fynbos, marshy areas, **endemic**					1	
FABACEAE	Xiphotheca fruticosa (L.) A.L. Schutte & B.-E. van Wyk		Hex River Mts, Cape Peninsula to Touwsberg	No change, sandstone slopes in fynbos, **endemic**					1	
GENTIANACEAE	Chironia baccifera L.	bitterbessiebos, perdebossie	Namaqualand to KwaZulu-Natal	No change, sandy flats and slopes						
GENTIANACEAE	Chironia jasminoides L.		Bainskloof to Langeberg Mts	Southern extension of distribution,					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				marshy slopes, **endemic**						
GENTIANACEAE	Sebaea aurea (L.f.) Sm.	kleingeelnaeltjiesblom	Pakhuis Mts to Cape Peninsula to Humansdorp	No change, sandy flats and slopes, **endemic**					1	
GERANIACEAE	Geranium incanum Burm.f.	horlosies, vrouebossie	Cape Peninsula to Port Alfred	No change, stony slopes						
GERANIACEAE	Pelargonium alchemilloides (L.) L'Hér.		Saldanha Bay to N Province	No change, open, moist places						
GERANIACEAE	Pelargonium betulinum (L.) L'Hér.	kanferblaar, maagpynbossie, suurbos	Yzerfontein to Knysna	No change, **coastal dune endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
GERANIACEAE	Pelargonium capitatum (L.) L'Hér.	kusmalva, rose-scented pelargonium	Lambert's Bay to KwaZulu-Natal	No change, coastal dunes and flats						
GERANIACEAE	Pelargonium elegans (Andrews) Willd.		Hermanus to Stilbaai, Port Elizabeth to Grahamstown	No change, coastal fynbos						
GERANIACEAE	Pelargonium grossularioides (L.) L'Hér.		Clanwilliam to KwaZulu-Natal	Southern extension of distribution, damp places						1
GERANIACEAE	Pelargonium myrrhifolium (L.) L'Hér. var. coriandrifolium	wildemalva	Kamiesberg to Uitenhage	No change, open places on stony sand						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
GERANIACEAE	Pelargonium triste (L.) L'Hér.	basbossie, kaneelbol, kaneeltjie, landwortel, naelblom, nagblom, rasmusbas, rooiwortel	Namaqualand to Albertinia	No change, sandy flats and slopes						
GRUBBIACEAE	Grubbia rosmarinifolia P.J.Bergius		Cold Bokkeveld Mts to Tsitsikamma Mts	No change, damp sandstone slopes, **endemic**					1	
LAMIACEAE	Salvia africana-lutea L.	bruinsalie, sandsalie, strandsalie, wild sage	Namaqualand to E Cape	No change, coastal dunes and slopes						
LAURACEAE	Cassytha ciliolata	false dodder,	Clanwilliam to E Cape	No change,						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	Nees	nooienshaar		parasite, various trees and shrubs						
LINACEAE	Linum africanum L.	African flax	Hopefield to Knysna	No change, sandstone and limestone slopes and flats, **endemic**					1	
MALVACEAE	Hermannia joubertiana Harv.		Hermanus to Mossel Bay	No change, limestone slopes						
MALVACEAE	Hermannia trifoliata L.		Hermanus to Gouritsmond	No change, **coastal limestone soils endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
MESEMBRYANTHEMACEAE	Carpobrotus acinaciformis (L.) L.Bolus	elandsvy, Hottentot fig, sour fig, suurvy	Saldanha to Mossel Bay	No change, **coastal dune endemic**						
MESEMBRYANTHEMACEAE	Drosanthemum candens (Haw.) Schwantes		Cape Peninsula to Bredasdorp	No change, coastal rocks, **endemic**					1	
MESEMBRYANTHEMACEAE	Drosanthemum intermedium (L.Bolus) L.Bolus		Simonstown to Mossel Bay	No change, coastal rocks, **endemic**					1	
MESEMBRYANTHEMACEAE	Jordaaniella dubia (Haw.) H.E.K.Hartmann	helderkruipvygie	Elandsbaai to Mossel Bay	No change, **coastal dunes endemic**					1	
MESEMBRYANTHEMACEAE	Jordaaniella		KwaZulu-Natal	Major						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	maritima (L.Bolus) Van Jaarsv.			southern extension of distribution						
MESEMBRYANTHEMACEAE	Lampranthus ceriseus (L.Bolus) L.Bolus		Cape Agulhas to Stilbaai	No change, **limestone regional endemic**		1				
MESEMBRYANTHEMACEAE	Lampranthus fergusoniae (L.Bolus) L.Bolus		Riversdale	South western extension of distribution, **limestone dunes and local endemic**				1		1
MESEMBRYANTHEMACEAE	Lampranthus tenuifolius (L.) N.E.Br.		Cape Peninsula	Eastern extension of distribution, in sand,			1			1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				local endemic						
MESEMBRYANTHEMACEAE	Mesembryanthemum canaliculatum Haw.	kruipvygie	Cape Peninsula to Port Elizabeth	No change, **coastal dunes endemic**					1	
MESEMBRYANTHEMACEAE	Mesembryanthemum vanrensburgii (L.Bolus) Klak	seepampoen	Hermanus to Bredasdorp	No change						
MESEMBRYANTHEMACEAE	Ruschia macowanii (L.Bolus) Schwantes	bosvygie	Yzerfontein to Agulhas	No change, coastal rocks, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
MYRICACEAE	Morella cordifolia (L.) Killick	candle berry, dune waxberry, glashout, wasbessie, waxberry	Yzerfontein to E Cape	No change, coastal sands and limestone						
MYRICACEAE	Morella quercifolia (L.) Killick	maagpynbossie	Namaqualand to E Cape	No change, coastal sandy and limestone flats and slopes						
MYRICACEAE	Morella serrata (Lam.) Killick	gammabos, wasbessie, waterolier, waxberry	Bainskloof to Mpumalanga and Caprivi	South eastern extension of distribution, rocky streamsides						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

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MYRSINACEAE	Myrsine africana L.		Bokkeveld Mts to Cape Peninsula to tropical Africa and Azores	No change, sandy slopes and flats in scrub						
OLEACEAE	Chionanthus foveolatus (E.Mey.) Stearn	fine-leaved ironwood	Cape Peninsula to Mpumalanga	No change, coastal bush and rocky slopes						
OLEACEAE	Olea capensis L. subsp. capensis	ysterhout	Olifants River Mts to E Cape and to tropical Africa	No change, forest and scrub						
OLEACEAE	Olea exasperata Jacq.	slanghout	Cape Peninsula to E Cape	No change, coastal scrub on sand and limestone						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

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OROBANCHACEAE	Hyobanche sanguinea L.	katnaels, wolwekos	Southern Namibia to Swaziland	Southern extension of distribution, sandy slopes and flats						1
OXALIDACEAE	Oxalis commutata Sond.		Cold Bokkeveld to Cape Peninsula and Caledon	No change, **endemic**					1	
OXALIDACEAE	Oxalis eckloniana C.Presl		Clanwilliam to Caledon	No change, damp places, **endemic**						1
OXALIDACEAE	Oxalis purpurea L.	grootsuring	Namaqualand and W Karoo to Port Elizabeth	No change, flats and slopes						
PENAEACEAE	Penaea mucronata L.		Robertson and Cape Peninsula to Langeberg Mts	No change, rocky sandstone slopes,					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
PLUMBAGINACEAE	Limonium scabrum (Thunb.) Kuntze	brakblommetjie, sea lavender	Cape Peninsula to E Cape	No change, coastal dunes and estuaries						
POLYGALACEAE	Muraltia divaricata Eckl. & Zeyh.		Groot Winterhoek Mts to Franschhoek and Riviersonderend	No change, rocky sandstone slopes, **endemic**					1	
POLYGALACEAE	Muraltia ericoides (Burm.f.) Steud.		Darling to Humansdorp	No change, low granite or sandstone slopes, **endemic**					1	

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POLYGALACEAE	Muraltia rubeacea Eckl. & Zeyh.		Hottentots Holland and Riviersonderend Mts to Agulhas	No change, sandstone and limestone slopes, **endemic**					1	
POLYGALACEAE	Muraltia satureioides DC.	skilpadbos	Cape Peninsula to Knysna	No change, coastal calcareous sands, **endemic**					1	
POLYGALACEAE	Nylandtia spinosa (L.) Dumort.	bokbessie, skilpadbessie	Namaqualand and W Karoo to E Cape	Southern extension of distribution, sandy flats and slopes						1
POLYGALACEAE	Polygala garcinii DC.		Bokkeveld Mts to Knysna	Southern extension of					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				distribution, sandy and clay slopes, **endemic**						
POLYGALACEAE	Polygala meridionalis Levyns		Cape Peninsula to De Hoop	No change, coastal sandy and limestone slopes and flats, **endemic**					1	
POLYGALACEAE	Polygala myrtifolia L.	Septemberbos	Bokkeveld Mts to KwaZulu-Natal	Southern extension of distribution, rocky slopes						1
POLYGALACEAE	Polygala refracta DC.		Cedarberg Mts to E Cape	Southern extension of distribution, rocky						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				sandstone slopes						
POLYGALACEAE	Polygala uncinata E.Mey. ex Meisn.		Humansdorp to Zimbabwe	South western extension of distribution, sandstone slopes in grassy fynbos						1
POLYGONACEAE	Rumex acetosella L. subsp. angiocarpus (Murb.) Murb.	boksuring, sheep sorrel	Cosmopolitan weed	No change, disturbed areas						
POLYGONACEAE	Rumex cordatus Poir.		Namaqualand and W Karoo to E Cape	Southern extension of distribution, sandy flats						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				and slopes						
PROTEACEAE	Aulax pallasia Stapf	dunbeentjiebos, kersbos, naaldblaarkanariebos, needle-leaf featherbush	Cold Bokkeveld to Swellendam	Southern extension of distribution, sandstone slopes, **endemic**					1	1
PROTEACEAE	Aulax umbellata (Thunb.) R.Br.	Christmasblom, sekelbos	Kogelberg to Stilbaai	No change, sandstone slopes and flats, **endemic**					1	
PROTEACEAE	Leucadendron coniferum (L.) Meisn	duinegeelbos, dune conebush, geelbos, rooitolbos	Cape Peninsula to Soetanysberg	No change, **coastal dunes endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
PROTEACEAE	Leucadendron linifolium (Jacq.) R.Br.	knoppiesbos, kraaltolbos	Eersterivier to Riversdale	No change, waterlogged **coastal flats endemic**					1	
PROTEACEAE	Leucadendron meridianum I.Williams	geelbos, limestone conebush	Gansbaai to Gouritsmond	No change, **limestone flats endemic**					1	
PROTEACEAE	Leucadendron salignum P.J.Bergius	common sunshine conebush, geelbos, geeltolbos, knopbos, knoppiesbos, rooibos, stompieknopbos, sunshine bush	Bokkeveld Mts to Grahamstown	Southern extension of distribution, sandy and clay slopes and flats						1

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PROTEACEAE	Leucadendron xanthoconus (Kuntze) K.Schum.	sickle-leaf conebush	Cape Peninsula to Potberg	No change, sandstone slopes, **endemic**					1	
PROTEACEAE	Leucospermum cordifolium (Salisb. ex Knight) Fourc.	bobbejaanklou, luisie, pincushion, speldekussing	Kogelberg to Soetanysberg	No change, rocky sandstone slopes, **endemic**					1	
PROTEACEAE	Leucospermum heterophyllum (Thunb.) Rourke	rankluisie	Elim to De Hoop	South western extension of distribution, **coastal slopes and flats endemic**					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
PROTEACEAE	Leucospermum hypophyllocarpodendron (L.) Druce subsp. hypophyllocarpodendron	kruipluisiebos, slangbossie	Piketberg to Agulhas Coast	No change, sandy flats, **endemic**					1	
PROTEACEAE	Leucospermum patersonii E.Phillips	basterkreupelhout	Kleinmond to Agulhas	No change, **coastal limestone and regional endemic**		1				
PROTEACEAE	Leucospermum pedunculatum Klotzsch		Danger Point to Agulhas	No change, **coastal dunes and regional endemic**		1				
PROTEACEAE	Leucospermum truncatulum	buxifolium, patrysbos	Groenland Mts to Bredasdorp	Southern extension of	1					1

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Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	(Salisb. ex Knight) Rourke			distribution, sandy slopes and flats, **regional endemic**						
PROTEACEAE	Mimetes cucullatus (L.) R.Br.	common pagoda, rooistompie	Cold Bokkeveld to Outeniqua and Kouga Mts	No change, sandstone slopes and flats, **endemic**					1	
PROTEACEAE	Mimetes saxatilis E.Phillips	geelstompie, rooistompie, stomoie	Pearly Beach to Struisbaai	No change, **limestone outcrops and local endemic**				1		
PROTEACEAE	Protea compacta R.Br.	Bot River protea, compacta, suikerbos, suikerkan	Betty's Bay to Bredasdorp Mts	Southern extension of distribution, **coastal**					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes and flats endemic						
PROTEACEAE	Protea cynaroides (L.) L.	bergroos, grootsuikerroos, king protea	Gifberg to Port Elizabeth	No change, moist sandstone slopes, **endemic**					1	
PROTEACEAE	Protea longifolia Andrews	long-leaf sugarbush, swartbaard, wolkop	Hottentots Holland Mts to Agulhas	No change, gravel flats and lower slopes, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
PROTEACEAE	Protea obtusifolia H.Buek. ex. Meisn.	Bredasdorp protea, Bredasdorp sugarbush, limestone sugarbush	Stanford to Stilbaai	No change, **limestone flats and hills endemic**					1	
PROTEACEAE	Protea susannae E.Phillips	stinkblaar, stinkblaarsuikerbos	Stanford to Stilbaai	No change, **coastal limestone and sand endemic**					1	
PROTEACEAE	Serruria elongata (P.J.Bergius) R.Br.		Du Toitskloof to Agulhas	No change, sandy flats and slopes, **endemic**					1	
PROTEACEAE	Serruria fasciflora Salisb. ex Knight	fynspinnekopbos, spinnekopbos, spinnekopbossie	Hopefield to George	No change, sandy flats and lower slopes,					1	

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Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
PROTEACEAE	Serruria nervosa Meisn.	fluted spiderhead	Kleinrivier and Bredasdorp Mts	No change, sandstone slopes, **endemic**					1	
PROTEACEAE	Spatalla curvifolia Salisb. ex Knight		Kogelberg to Agulhas coast	No change, sandstone slopes, **regional endemic**	1					
PROTEACEAE	Spatalla ericoides E.Phillips		W Agulhas coast	No change, **coastal sands between limestone ridges, local endemic**				1		

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
RANUNCULACEAE	Knowltonia vesicatoria (L.f.) Sims subsp. humilis H.Rasmussen		Bokkeveld Mts to Cape Peninsula to E Cape	No change, scrub or woody ravines						
RHAMNACEAE	Phylica amoena Pillans		Agulhas coast	No change, **coastal dunes and local endemic**				1		
RHAMNACEAE	Phylica axillaris Lam. var. maritima Pillans		Agulhas coast to Katberg and Alexandria	No change, rocky slopes in coastal bush or forest margins						
RHAMNACEAE	Phylica disticha Eckl. & Zeyh.		Cape Peninsula to Hermanus	No change, sandstone						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes						
RHAMNACEAE	Phylica dodii N.E. Br.		Cape Peninsula to Knysna	No change, sandy or limestone flats and slopes, **endemic**					1	
RHAMNACEAE	Phylica ericoides L.		Saldanha to Port Elizabeth	No change, coastal slopes and deep sands						
RHAMNACEAE	Phylica humilis Sond.		Sir Lowry's Pass to Bredasdorp	No change, sandstone slopes, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
RHAMNACEAE	Phylica imberbis P.J.Bergius		Bokkeveld Mts to Knysna and Swartberg Mts	No change, sandstone slopes and flats, **endemic**					1	
RHAMNACEAE	Trichocephalus stipularis (L.) Brongn.	hondegesiggie	Cedarberg Mts to Knysna	Southern extension of distribution, sandy flats and lower slopes, **endemic**					1	1
ROSACEAE	Cliffortia falcata L.f.		Cape Peninsula to Knysna	No change, coastal slopes, **endemic**					1	
ROSACEAE	Cliffortia ferruginea L.f.	glastee, pypsteelbos, teringtee	Cape Peninsula to Port Elizabeth	No change, near water,					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				usually on lower slopes, **endemic**						
ROSACEAE	Cliffortia ilicifolia L.	doringtee, Jankoensdoring	Cape Peninsula to Port Elizabeth	No change, sandstone slopes, **endemic**					1	
ROSACEAE	Cliffortia stricta Weim.		Cape Peninsula to Humansdorp	No change, flats and lower slopes, **endemic**					1	
ROSACEAE	Cliffortia strobilifera L.	kammiebos, pypsteelbos, vleibos	Kamiesberg and Bokkeveld Mts to KwaZulu-Natal	Southern extension of distribution, moist sandstone flats and lower slopes						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
RUBIACEAE	Anthospermum aethiopicum L.	jakkalstert, katstert, seeroogbossie	Bokkeveld Escarpment to E Cape	Southern extension of distribution, usually clay slopes						1
RUBIACEAE	Anthospermum prostratum Sond.		Saldanha to Port Elizabeth	No change, **coastal dunes endemic**					1	
RUBIACEAE	Anthospermum spathulatum Spreng.	skaapbos	Namaqualand to E Cape	Southern extension of distribution, sandy soils						1
RUBIACEAE	Galium tomentosum Thunb.	kleefgras	S Namibia to E Cape and Free State	Southern extension of distribution, scrub						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
RUTACEAE	Adenandra viscida Eckl. & Zeyh.		Kleinrivier Mts to Agulhas	No change, sandstone or limestone hills, **regional endemic**	1					
RUTACEAE	Agathosma bifida (Jacq.) Bart. & H.L.Wendl.		Bokkeveld to Outeniqua Mts	Southern extension of distribution, sandy mountain slopes and flats, **endemic**					1	
RUTACEAE	Agathosma cerefolium (Vent.) Bartl. & H.L.Wendl.	anysboegoe, klamboegoe	Hermanus to Humansdorp	No change, coastal lime sands and limestone flats and hills,					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
RUTACEAE	Agathosma dielsiana Schltr. ex Dümmer		Bredasdorp to George	Southern extension of distribution, dunes or limestone hills, **endemic**					1	1
RUTACEAE	Agathosma geniculata Pillans		Stanford to Stilbaai	No change, **coastal limestone endemic**					1	
RUTACEAE	Agathosma haelkraalensis P.A.Bean MS		Avila to Hagelkraal	South western extension of distribution, sheltered				1		1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				crevices in limestone, **endemic**						
RUTACEAE	Agathosma serpyllacea Licht. ex Roem. & Schult.		Piketberg to Humansdorp	Southern extension of distribution, coastal or inland sand or limestone flats and slopes, **endemic**					1	1
RUTACEAE	Diosma awilana I.Williams		Baardskeerdersbos	Western extension of distribution, stony calcareous sands						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
RUTACEAE	Diosma haelkraalensis I.Williams		Pearly Beach to Hagelkraal	No change, **limestone hills endemic**					1	
RUTACEAE	Euchaetis burchellii Dummer		Gansbaai to George	No change, **coastal dunes endemic**					1	
SANTALACEAE	Osyris compressa (P.J.Bergius) A.DC.	pruimbas	Cedarberg Mts to tropical Africa	Southern extension of distribution, sandstone slopes						1
SANTALACEAE	Osyris speciosa (A.W.Hill) J.C.Manning & Goldblatt		Houwhoek to Agulhas	No change, coastal sandstone and limestone	1					

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				flats and slopes, **regional endemic**						
SANTALACEAE	Thesium aggregatum A.W.Hill		Namaqualand to Bredasdorp, Humansdorp	No change, sandstone flats and slopes						
SANTALACEAE	Thesium subnudum Sond.		Olifants River Mts to Port Elizabeth	Southern extension of distribution, sandstone slopes, **endemic**					1	1
SAPOTACEAE	Sideroxylon inerme L. subsp. inerme		Cape Peninsula to tropical Africa	No change, sand dunes and coastal bush						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
SCROPHULARIACEAE	Chaenostoma hispidum (Thunb.) Druce		Cape Peninsula to Bredasdorp	No change						
SCROPHULARIACEAE	Chaenostoma subspicatum Benth.		Western Cape	No change						
SCROPHULARIACEAE	Dischisma ciliatum (P.J.Bergius) Choisy subsp. erinoides (L.f.) Roessler		Lokenberg to Port Elizabeth	Southern extension of distribution, rocky slopes and flats, **endemic**					1	1
SCROPHULARIACEAE	Hebenstretia dentata L.	slakblom	Namaqualand to Cape Peninsula	Eastern extension of distribution, rocky sandstone soils						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
SCROPHULARIACEAE	Jamesbrittenia albomarginata Hilliard		Gansbaai to Stilbaai	No change, coastal limestone flats and dunes in scrub, **endemic**					1	
SCROPHULARIACEAE	Jamesbrittenia calciphila Hilliard		Pearly Beach to Stilbaai	No change, coastal limestone rocks and cliffs, **endemic**					1	
SCROPHULARIACEAE	Lyperia lychnidea (L.) Druce	soettraanblommetjie	Saldanha Bay to Stilbaai	No change, coastal sands in scrub, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
SCROPHULARIACEAE	Manulea caledonica Hilliard		Stanford to Stilbaai	No change, sandy calcareous soils, **endemic**					1	
SCROPHULARIACEAE	Manulea crassifolia Benth.		Northern Province	Southern extension of distribution						
SCROPHULARIACEAE	Microdon dubius (L.) Hilliard		Kamiesberg to Ladismith	Southern extension of distribution, rocky sandstone slopes						1
SCROPHULARIACEAE	Nemesia affinis Benth.	bontleeubekkie, leeubekkie, weeskindertjie(s)	S Namibia to E Cape	Southern extension of distribution, sandy and						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				granite slopes and flats						
SCROPHULARIACEAE	Selago diffusa Thunb.		Gansbaai to Stilbaai	No change, coastal slopes, **endemic**					1	
SCROPHULARIACEAE	Selago polystachya L.		Saldanha to Gansbaai	No change, rocky slopes, **endemic**					1	
SCROPHULARIACEAE	Selago scabrida Thunb.		Cape Peninsula to Swellendam	Southern extension of distribution, rocky slopes, **endemic**					1	1
SCROPHULARIACEAE	Selago setulosa Rolfe		Hagelkraal to Mossel Bay	Major western extension of				1		1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				distribution, **limestone hills and local endemic**						
SCROPHULARIACEAE	Zaluzianskya capensis (L.) Walp.		Namaqualand to E Cape	Southern extension of distribution, sandy places						1
SCROPHULARIACEAE	Zaluzianskya villosa F.W.Schmidt	drumsticks	Langebaan to Pearly Beach	No change, sandy flats along the coast, **endemic**					1	
SOLANACEAE	Solanum africanum Mill.	dronkbessie, dronktou, melkellie	Cape Peninsula to KwaZulu-Natal	No change, coastal dunes in bush						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
THYMELAEACEAE	Gnidia juniperifolia Lam.		Cape Peninsula to Riversdale	No change, mountain slopes, **endemic**					1	
THYMELAEACEAE	Gnidia pinifolia L.	witkoorsbossie	Piketberg to E Cape	Southern extension of distribution, flats to middle slopes						1
THYMELAEACEAE	Gnidia tenella (Meisn.) Meisn.		Ceres to Bredasdorp	No change, mountain slopes, **endemic**					1	
THYMELAEACEAE	Passerina corymbosa Eckl. ex C.H.Wright	sandgonnabas	Tulbagh to E Cape	No change, sandy, often disturbed flats and						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes						
THYMELAEACEAE	Passerina paleacea Wikstr.		Saldanha Bay to Agulhas	No change, **coastal dunes endemic**					1	
THYMELAEACEAE	Passerina rigida Wikstr.	duinegonnabas, gonnabas	Cape Peninsula to KwaZulu-Natal	No change, coastal dunes						
THYMELAEACEAE	Passerina truncata (Meisn.) Bredenkamp & A.E.van Wyk	bakkerbos, skoenveterbos, veterbos	Namaqualand and Bokkeveld Mts to Baviaanskloof	Southern extension of distribution, sandy and stony flats, **endemic**					1	1
THYMELAEACEAE	Struthiola dodecandra (L.) Druce		Cape Peninsula to Bredasdorp, Knysna	No change, flats and lower slopes,					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
THYMELAEACEAE	Struthiola striata Lam.	katstert, veërtjie	Yzerfontein to Mossel Bay, Uitenhage	No change, flats and lower slopes, **endemic**					1	
Urticaceae	Droguetia iners (Forssk.) Schweinf.		Cape Peninsula to Indonesia	No change, coastal forest, scrub and among rocks						
VISCACEAE	Viscum capense L.f.	Cape mistletoe, mistletoe, voëlent	S Namibia to Caledon	Slight south eastern extension of distribution, parasitic on various shrubs						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ZYGOPHYLLACEAE	Roepera flexuosum Eckl. & Zeyh.	spekbossie	Velddrif to Knysna	No change, **coastal sands and limestone endemic**					1	
ZYGOPHYLLACEAE	Roepera fulva L.	spekbossie	Gifberg to Port Elizabeth	Southern extension of distribution, sandy flats and rocky slopes, **endemic**					1	1
ZYGOPHYLLACEAE	Roepera fuscata Van Zyl		Betty's Bay to De Hoop	No change, sandy flats on coastal limestone, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
AMARYLLIDACEAE	Brunsvigia orientalis (L.) Aiton ex Eckl.	candelabra flower, kandelaar, koningskandelaar(blom)	S Namaqualand to Cape Peninsula and Knysna	No change, coastal lowlands						
AMARYLLIDACEAE	Haemanthus coccineus L.	April fool, poeierkwas, rooikwas, velskoenblaar	S Namibia to Port Elizabeth	Southern extension of distribution, coastal scrub and rocky slopes						1
AMARYLLIDACEAE	Haemanthus sanguineus Jacq.	brandlelie, velskoenblaar	Nardouw Mts to Port Elizabeth	No change, lower slopes, **endemic**					1	
ARACEAE	Zantedeschia aethiopica (L.) Spreng.	arum, arum lily, calla lily, pig lily, varkblom	Richtersveld, Kamiesberg, Bokkeveld Mts to N Province	Southern extension of distribution, seasonally						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				damp places						
ASPARAGACEAE	Asparagus aethiopicus L.	haakdoring	Namaqualand to Transkei	Southern extension of distribution, mainly dry bush						1
ASPARAGACEAE	Asparagus asparagoides (L.) Druce	breëblaarklimop, breëblaarkransie, krulkransie	Gifberg to Port Elizabeth to tropical Africa	No change, widespread in bush						
ASPARAGACEAE	Asparagus capensis L.	katbos, katdoring, wag-'n-bietjie, wag-'n-bietjiebos	S Namibia to Transkei	Southern extension of distribution, rocky slopes						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASPARAGACEAE	Asparagus rubicundus P.J.Bergius	swarthaakdoring	Kamiesberg, Gifberg to Uitenhage	Southern extension of distribution, sandy and granite slopes						1
ASPARAGACEAE	Asparagus scandens Thunb.		Gifberg to Tsitsikamma Mts	South western extension of distribution, forest and bush in shade, **endemic**					1	1
ASPARAGACEAE	Asparagus stipulaceus Lam.		Cape Peninsula to Bredasdorp	No change, **coastal dune endemic**						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
ASPHODELACEAE	Trachyandra ciliata (L.f.) Kunth	hotnotskool, wildeblomkool	Namibia to Grahamstown	No change, damp sandy coastal flats						
ASPHODELACEAE	Trachyandra divaricata (Jacq.) Kunth	duinekool, hottentotskool	Namaqualand to Port Alfred	No change, littoral dunes and sand flats						
ASPHODELACEAE	Trachyandra revoluta (L.) Kunth		Richtersveld to Port Alfred	No change, sandy flats						
COLCHICACEAE	Colchicum eucomoides (Jacq.) J.C.Manning & Vinnersten		Namaqualand to E Cape	Southern extension of distribution, clay flats and slopes						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CYPERACEAE	Ficinia bulbosa (L.) Nees		Cedarberg Mts to E Cape	Southern extension of distribution, strandveld, coastal and mountain fynbos						1
CYPERACEAE	Ficinia capitella (Thunb.) Nees		W Karoo, Ceres to Caledon	No change, flats and slopes below 1700m						
CYPERACEAE	Ficinia deusta (P.J.Bergius) Levyns		Namaqualand to Knysna	South western extension of distribution, mountain slopes below 1700m						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CYPERACEAE	Ficinia filiformis (Lam.) Schrad.		Western Cape	No change						
CYPERACEAE	Ficinia lateralis (Vahl) Kunth	dune sedge	Cape Peninsula to E Cape	No change, coastal sands						
CYPERACEAE	Ficinia nodosa (Rottb.) Goetgh.	steekbiesie, vleibiesie	Namaqualand to KwaZulu-Natal and widespread in S hemisphere	No change, damp sandy flats in coastal areas						
CYPERACEAE	Ficinia oligantha (Steud.) J.Raynal		Clanwilliam to Knysna	Southern extension of distribution, lower slopes, **endemic**					1	1
CYPERACEAE	Ficinia praemorsa Nees		Stanford to Mossel Bay	No change, **limestone flats**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
CYPERACEAE	Ficinia ramosissima Kunth		Cape Peninsula to E Cape	No change, lower slopes and rock crevices in shade						
CYPERACEAE	Ficinia secunda (Vahl) Kunth		Cedarberg Mts to Mossel Bay	Southern extension of distribution, sandy flats below 1000m, **endemic**					1	1
CYPERACEAE	Ficinia zeyheri Boeck.		Cape Peninsula to Uniondale	No change, sandy soil in mountain seeps below 1700m,					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
CYPERACEAE	Hellmuthia membranacea (Thunb.) R.Haynes & K.Lye	biesie, knopbiesie	Saldanha to Knysna	No change, coastal sands below 500m, **endemic**					1	
CYPERACEAE	Isolepis antarctica (L.) Roem. & Schult.		Cape Peninsula to Langeberg Mts	No change, damp flats and slopes to 800m, endemic					1	
CYPERACEAE	Neesenbeckia punctoria (Vahl) Levyns		Cape Peninsula to Caledon	Slight south eastern extension of distribution, streamsides on lower		1				1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes to 800m, **regional endemic**						
CYPERACEAE	Schoenoxiphium lanceum (Thunb.) Kuk.		Cape Peninsula to Humansdorp	No change, shady lower slopes, **endemic**					1	
CYPERACEAE	Schoenus nigricans L.		Cape Peninsula to E Cape, more or less worldwide	No change, marshes and watercourses on flats and lower slopes below 200m						
CYPERACEAE	Tetraria brachyphylla Levyns		Cape Peninsula to Plettenberg Bay	No change, sandy coastal dunes and lower slopes					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				below 200m, **endemic**						
CYPERACEAE	Tetraria bromoides (Lam.) Pfeiffer	bergpalmiet	Porterville to Cape Peninsula to Uitenhage	No change, dry mountain fynbos up to 1500m, **endemic**					1	
CYPERACEAE	Tetraria capillacea (Thunb.) C.B.Clarke		Cape Peninsula to E Cape	No change, mountain slopes to 1500m, dry to moist mountain fynbos						
CYPERACEAE	Tetraria compacta Levyns		Villiersdorp to Kleinmond	South eastern extension of distribution,			1			1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				lower slopes, **local endemic**						
CYPERACEAE	Tetraria compar (L.) Lestib.		Cape Peninsula to Albertinia	No change, sandy lower slopes and coastal slopes, **endemic**					1	
CYPERACEAE	Tetraria cuspidata (Rottb.) C.B.Clarke		Cedarberg Mts to Cape Peninsula to Mpumalanga	No change, mountain slopes						
CYPERACEAE	Tetraria exilis Levyns		Du Toit's Kloof Mts to Kleinmond	No change, flats and slopes, **regional endemic**	1					

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
CYPERACEAE	Tetraria flexuosa (Thunb.) C.B.Clarke		Ceres to Cape Peninsula to Riversdale	No change, flats to middle slopes, **endemic**					1	
CYPERACEAE	Tetraria thermalis (L.) C.B.Clarke	bergpalmiet	Cape Peninsula to Riversdale	No change, rocky flats and slopes below 1000m, **endemic**					1	
HAEMODORACEAE	Wachendorfia paniculata Burm.	koffiepit, rooikanol, spinnekopblom	Bokkeveld Mts to Port Elizabeth	Southern extension of distribution, mainly sandstone soils, **endemic**					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
HYACINTHACEAE	Albuca cooperi Baker	blougif, geldbeursie	Richtersveld and W Karoo to Cape Peninsula to Willowmore	No change, stony, mostly sandy slopes and flats, sometimes limestone						
HYACINTHACEAE	Albuca juncifolia Baker	kleintamarak	Ceres to Cape Peninsula to Mossel Bay	No change, sandy and calcareous flats, **endemic**					1	
IRIDACEAE	Aristea africana (L.) Hoffmanns.	blousuurkanol, koringblommetjie, maagbossie	Gifberg to Bredasdorp and Riversdale	No change, sandy flats and mountain slopes, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
IRIDACEAE	Aristea glauca Klatt		Ceres and Cape Peninsula to Riversdale	No change, coastal and lower slopes, **endemic**					1	
IRIDACEAE	Bobartia longicyma J.B.Gillett subsp. magna J.B.Gillett ex Strid		Kuilsrivier to Potberg	No change, sandy flats and lower slopes, **endemic**					1	
IRIDACEAE	Chasmanthe aethiopica (L.) N.E.Br.	kleinpiempiempie, suurkanolpypie	Darling to E Cape	No change, hills and flats on granite, sandstone, or shale, mainly coastal in bush or forest margins						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
IRIDACEAE	Ferraria crispa Burm.	krulletjie, spinnekopblom, uiltjie	Lambert's Bay to Mossel Bay, Little Karoo	No change, mainly coastal, sandstone or granite rocks, **endemic**					1	
IRIDACEAE	Gladiolus bullatus Thunb. ex G.J.Lewis	berg (mountain) bluebell, Caledon bluebell	Kogelberg to Potberg	No change, sandstone slopes in fynbos, **endemic**					1	
IRIDACEAE	Gladiolus debilis Ker Gawl.	kalkoentjie, little painted lady, painted lady	Cape Peninsula to Bredasdorp	No change, rocky sandstone slopes, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
IRIDACEAE	Gladiolus martleyi L.Bolus		Bokkeveld Mts to Riversdale	South western extension of distribution, sandy and rocky flats and lower slopes to 200m, **endemic**					1	1
IRIDACEAE	Gladiolus variegatus (G.J.Lewis) Goldblatt & J.C.Manning		Gansbaai to Cape Agulhas	No change, **limestone outcrops and regional endemic**		1				
IRIDACEAE	Hesperantha falcata (L.f.) Ker Gawl.	bontrokaandblom, bontrokkie	Bokkeveld Mts to Port Elizabeth	Southern extension of distribution, sandstone and shale					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes, **endemic**						
IRIDACEAE	Ixia odorata Ker Gawl.	geelkalossie, soetkalossie	Citrusdal to Hermanus	South eastern extension of distribution, sandstone and granite slopes, **endemic**					1	1
IRIDACEAE	Ixia polystachya L.	koringblommetjie, witkalossie	Cedarberg to Caledon	No change, granitic and sandstone slopes and flats, **endemic**					1	
IRIDACEAE	Moraea bulbillifera	uintjie tulp	Cape Peninsula to Alexandria	No change, sandstone						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	(G.J.Lewis) Goldblatt			and limestone soils, mainly coastal						
IRIDACEAE	Moraea fugax (D.Delaroche) Jacq.	hottentotsbrood, hottentotsuintjie, hottentotuintjie, soetuintjie, uintjie	Namaqualand to Swellendam	Southern extension of distribution, deep sands and rocky sandstone and granitic soils						1
IRIDACEAE	Moraea neglecta G.J.Lewis	geelflappie	Bokkeveld Mts to Agulhas coast	No change, deep sandy soils, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
IRIDACEAE	Moraea tripetala (L.f.) Ker Gawl.	blou-uintjie, dwergtulp, kleinuintjie, perde-uintjie, tulp	Bokkeveld Mts and W Karoo to Riversdale and Swartberg Mts	No change, rocky sandstone and clay soils, to 1200m						
IRIDACEAE	Romulea dichotoma (Thunb.) Baker		Stanford to Humansdorp	No change, sandy flats and slopes, **endemic**					1	
IRIDACEAE	Tritoniopsis burchellii (N.E.Br.) Goldblatt		Riebeek-Kasteel to Albertinia	Southern extension of distribution, rocky sandstone slopes, 200-600m, **endemic**					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
IRIDACEAE	Watsonia stenosiphon L.Bolus		Hermanus to Potberg	No change, **sandy coastal flats endemic**					1	
JUNCACEAE	Juncus kraussii Hochst. subsp. kraussii	biesie, rush	Cape Peninsula to Mozambique, Australia, S America	No change, saline marshes						
LANARIACEAE	Lanaria lanata (L.) T.Durand & Schinz	Cape eidelweiss, kapokblom, perdekapok	Bainskloof to E Cape	Southern extension of distribution, clay and sandstone slopes						1
ORCHIDACEAE	Bonatea speciosa (L.f.) Willd. var. speciosa	moederkappie, Oktoberlelie	Yzerfontein to Zimbabwe	South eastern extension of distribution, coastal scrub						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				and forest margins						
ORCHIDACEAE	Corycium orobanchoides (L.f.) Sw.	bastertrewwa	Klawer to Albertinia	South western extension of distribution, sandy flats, **endemic**					1	1
ORCHIDACEAE	Disa bracteata Sw.	orgideetjie, orgidekie	Vredendal to E Cape	No change, fynbos, especially roadsides						
ORCHIDACEAE	Disa densiflora (Lindl.) Bolus		Cape Peninsula to Bredasdorp and Storms River mouth	No change, sandy soils, **endemic**					1	
ORCHIDACEAE	Satyrium carneum	rooikoppie, rooitrewwa	Cape Peninsula to	No change, **coastal flats**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
	(Dryand.) Sims		Riversdale	**endemic**						
ORCHIDACEAE	Satyrium ligulatum Lindl.		Namaqualand to KwaZulu-Natal	Southern extension of distribution, scrub, forest and grassland						1
POACEAE	Aristida junciformis Trin. & Rupr.	wire grass	Cedarberg Mts to tropical E Africa	Southern extension of distribution, mountain slopes						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
POACEAE	Cymbopogon marginatus (Steud.) Stapf ex Burtt Davy	(scented) turpentine grass, lemon grass, motwortelterpentyngras, muskusgras, stinkgras, terpentyngras	Namaqualand to E Cape	No change, rocky lower slopes						
POACEAE	Cynodon dactylon (L.) Pers.	Bermuda grass, couch, fine quick grass, fynkweek, gewone kweekgras	throughout Africa	No change, mountains and flats						
POACEAE	Ehrharta calycina Sm.	common ehrharta, polgras, rooigras, rooisaadgras	Namaqualand to KwaZulu-Natal	Southern extension of distribution, flats and slopes						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
POACEAE	Ehrharta erecta Lam.		Cape Peninsula to E Africa	No change, shady habitats, often weedy						
POACEAE	Ehrharta villosa Schult.f. var. villosa	pypgras	St. Helena Bay to Port Elizabeth	No change, **coastal dune endemic**					1	
POACEAE	Festuca scabra Vahl	munniksgras	widespread in southern Africa	No change, dry flats and slopes						
POACEAE	Hyparrhenia hirta (L.) Stapf	thatch grass	widespread through Africa and Mediterranean	No change, disturbed areas and grassland						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
POACEAE	Imperata cylindrica (L.) Raeuschel	beddinggras, cotton-wool grass, donsgras, silwergaargras, sygras	tropical African weed	No change, wet habitats						
POACEAE	Koeleria capensis (Steud.) Nees	polgras, strandgras	Namaqualand to KwaZulu-Natal	Southern extension of distribution, coastal sands and mountain slopes						1
POACEAE	Merxmuellera cincta (Nees) Conert		Olifants River Mts to E Cape	No change, streamsides						
POACEAE	Merxmuellera rufa (Nees) Conert	brandgras	Bokkeveld Mts to Hermanus	No change sandstone slopes,					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				endemic						
POACEAE	Pentaschistis aristidoides (Thunb.) Stapf		Bokkeveld Mts to Agulhas	No change, rocky sandstone slopes, **endemic**					1	
POACEAE	Pentaschistis calcicola H P Linder		Gansbaai to Cape Infanta	No change, limestone pavements, **endemic**					1	
POACEAE	Pentaschistis curvifolia (Schrad.) Stapf	kwasgras, tasel grass	Bokkeveld Mts to Grahamstown	Southern extension of distribution, sandstone slopes, especially shallow soils and paths						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
POACEAE	Pentaschistis pallida (Thunb.) H.P.Linder	duinegras, haasgras	Namaqualand to E Cape	Southern extension of distribution, slopes and flats						1
POACEAE	Pseudopentameri s macrantha (Schrad.) Conert		Cape Peninsula to Stilbaai	No change, sandstone slopes, **endemic**					1	
POACEAE	Sporobolus virginicus (L.) Kunth	brakgras, brakkweek, sea rush grass	worldwide	No change, dunes, beaches and coastal marshes						
POACEAE	Stenotaphrum secundatum (Walter) Kuntze	buffalo grass, buffelsgras, kweekgras	Cape Peninsula to pantropical	No change, sandy coastal slopes and						

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				flats						
POACEAE	Stipa dregeana Steud.		Cape Peninsula to E tropical Africa	No change, forest margins						
POACEAE	Stipagrostis zeyheri (Nees) De Winter	Cape Bushman grass, steekgras	Namaqualand to Mpumalanga	Southern extension of distribution, sandy flats						1
POACEAE	Themeda triandra Forssk.	red grass, rooigras	throughout tropical Africa and Asia	No change, widespread in grassland						
POACEAE	Tribolium hispidum (Thunb.) Desv.	haasgras	Namaqualand to E Cape	Southern extension of distribution, flats and						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes						
POACEAE	Tribolium uniolae (L.f.) Renvoize	koringgras	Bokkeveld Mts to Port Elizabeth	Southern extension of distribution, clay and granite flats, **endemic**					1	1
RESTIONACEAE	Calopsis fruticosa (Mast.) H.P.Linder		Cape Peninsula to Gouritz River mouth (Linder, 2002	No change, **coastal limestone endemic**					1	
RESTIONACEAE	Calopsis hyalina (Mast.) H.P.Linder		Sir Lowry's Pass to Caledon Swartberg, to the Soetanysberg (Linder, 2002	No change, flats, **endemic**					1	
RESTIONACEAE	Calopsis pulchra Esterh.		Pearly Beach to Struisbaai	No change, limestone			1			

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				and sandstone flats, **local endemic**						
RESTIONACEAE	Elegia cuspidata Mast.	blombiesie	Bokbaai to Kleinmond	South eastern extension of distribution, **coastal dunes endemic**					1	1
RESTIONACEAE	Elegia equisetacea (Mast.) Mast.		Langeberg Mts: Swellendam to Van Staden's Mts	No change, **endemic**					1	
RESTIONACEAE	Elegia filacea Mast.		Cedarberg to Port Elizabeth	Southern extension of distribution, damp flats and sandy					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				slopes to 2100m, **endemic**						
RESTIONACEAE	Elegia hookeriana (Mast.) Pillans		Western Cape	No change						
RESTIONACEAE	Elegia juncea L.	besemriet, vlerkiesriet	Groot Winterhoek Mts and Cape Peninsula to Swartberg Mts	No change, **endemic**					1	
RESTIONACEAE	Elegia microcarpa (Kunth) Pillans		Melkbos to Port Elizabeth	No change, coastal sands and limestones, **endemic**					1	
RESTIONACEAE	Elegia nuda (Rottb.) Kunth		Darling to Albertinia	No change, sandy flats, endemic					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
RESTIONACEAE	Elegia stipularis Mast.	cushion restio	Cape Peninsula to Mossel Bay	No change, **endemic**					1	
RESTIONACEAE	Elegia tectorum (L.f.) Raf.	besemriet, dakriet, dekriet, olifantriet	Clanwilliam to Port Elizabeth	No change, marshes and seeps on deep sands, **endemic**					1	
RESTIONACEAE	Hypodiscus aristatus (Thunb.) Mast.		Clanwilliam to Baviaanskloof Mts	No change, sandstone soils, **endemic**					1	
RESTIONACEAE	Hypodiscus procurrens Esterh.		Agulhas Peninsula	No change, **local endemic**			1			
RESTIONACEAE	Hypodiscus rigidus Mast.		Soetanysberg to Witsand	No change, **coastal limestone**		1				

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				and regional endemic						
RESTIONACEAE	Hypodiscus willdenowia (Nees) Mast.		Cold Bokkeveld to Humansdorp	Southern extension of distribution, sandy slopes and flats, **endemic**					1	1
RESTIONACEAE	Ischyrolepis eleocharis (Nees ex Mast.) H.P.Linder	katstert, katstertriet	Cape Peninsula to Port Elizabeth	No change, coastal limestone slopes, **endemic**					1	
RESTIONACEAE	Ischyrolepis leptoclados (Mast.) H.P.Linder	besemriet	Betty's Bay to Knysna	No change, coastal sands, **endemic**					1	

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
RESTIONACEAE	Mastersiella digitata (Thunb.) Gilg-Ben.		Cape Peninsula to Potberg	No change, **endemic**					1	
RESTIONACEAE	Restio bifidus Thunb.		Cape Peninsula to Kleinrivier Mts	No change, **endemic**					1	
RESTIONACEAE	Restio bifurcus Nees ex Mast.		Cape Peninsula to Caledon, Witteberg	No change, rocky slopes, **endemic**					1	
RESTIONACEAE	Restio bolusii Pillans		Worcester to Bredasdorp	No change, **endemic**					1	
RESTIONACEAE	Restio egregius Hochst.		Cape Peninsula to Villiersdorp and Bredasdorp	No change, **endemic**					1	
RESTIONACEAE	Restio triticeus Rottb.	besemgoed, besemriet, kanet	Malmesbury to E Cape	Southern extension of distribution						1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
RESTIONACEAE	Staberoha banksii Pillans		Worcester and Cape Peninsula to Bredasdorp	No change, sandstone slopes at low altitude, **endemic**					1	
RESTIONACEAE	Thamnochortus erectus (Thunb.) Mast.	dekriet, jakkalsstert, jakkalsstertriet, wyfieriet	Malmesbury to Knysna	Southern extension of distribution, **endemic**					1	1
RESTIONACEAE	Thamnochortus fraternus Pillans		Cape Peninsula to Bredasdorp	No change, **limestone endemic**					1	
RESTIONACEAE	Thamnochortus fruticosus P.J.Bergius	besemriet	Tulbagh to KwaZulu-Natal	Southern extension of distribution						1
RESTIONACEAE	Thamnochortus guthrieae Pillans		Malmesbury to Bredasdorp	South western					1	1

APPENDIX 4.2.3. DISTRIBUTION OF SPECIES RECORDED AT BANTAMSKLIP: ENDEMICS

Family	Species name	Common names	Distribution (Goldblatt & Manning, 2000)	Comments	Regional endemics	Regional and habitat endemic	Local endemics	Local and habitat endemics	>100km habitat endemics	Range extensions
				extension of distribution, **endemic**						
RESTIONACEAE	Thamnochortus pellucidus Pillans	dwergriet	Caledon to Bredasdorp	Southern extension of distribution, **regional endemic**	1					1
RESTIONACEAE	Willdenowia teres Thunb.		Ceres to Uniondale	Southern extension of distribution, **endemic**					1	1
TOTAL					**10**	**8**	**6**	**10**	**212**	**92**

APPENDIX 4.2.4. EXPLANATION OF ABBREVIATIONS APPEARING IN FIGURE 4.2.11

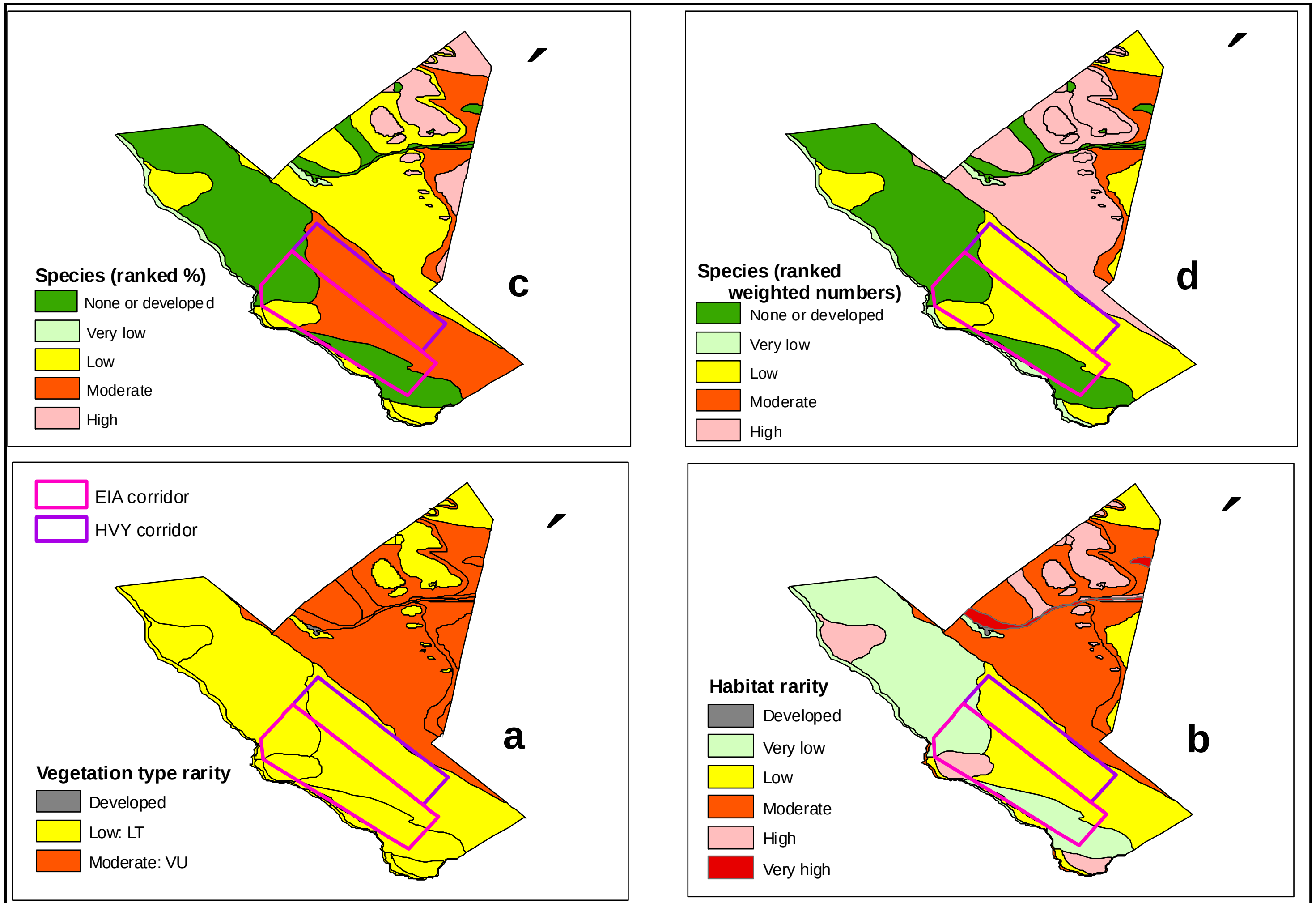
BANTAMSKLP CALC	Bantamsklip calcareous
BRNFNTN DT	Brandfontein dune thicket
GRTBS CALC	Grootbos calcareous
PAAPKFNTN CALC	Paapekuilsfontein calcareous
PEARLY BCH CALC	Pearly Beach calcareous
QUOIN PT CALC	Quoin Point calcareous
RENKOP PAR	Renosterkop parabolic dunes
SANDBRG S/L	Sandberg (Cape Agulhas) sand over limestone
SPRNGFNTN LSTN & DNS	Springfontyn limestone and dunes\
UILKRLMND CALC	Uilkraalmond calcareous
WALKBY CALC	Walker Bay calcareous

APPENDIX 4.2.5. CALCULATION OF RARITY & SENSITIVITY AT BANTAMSKLIP

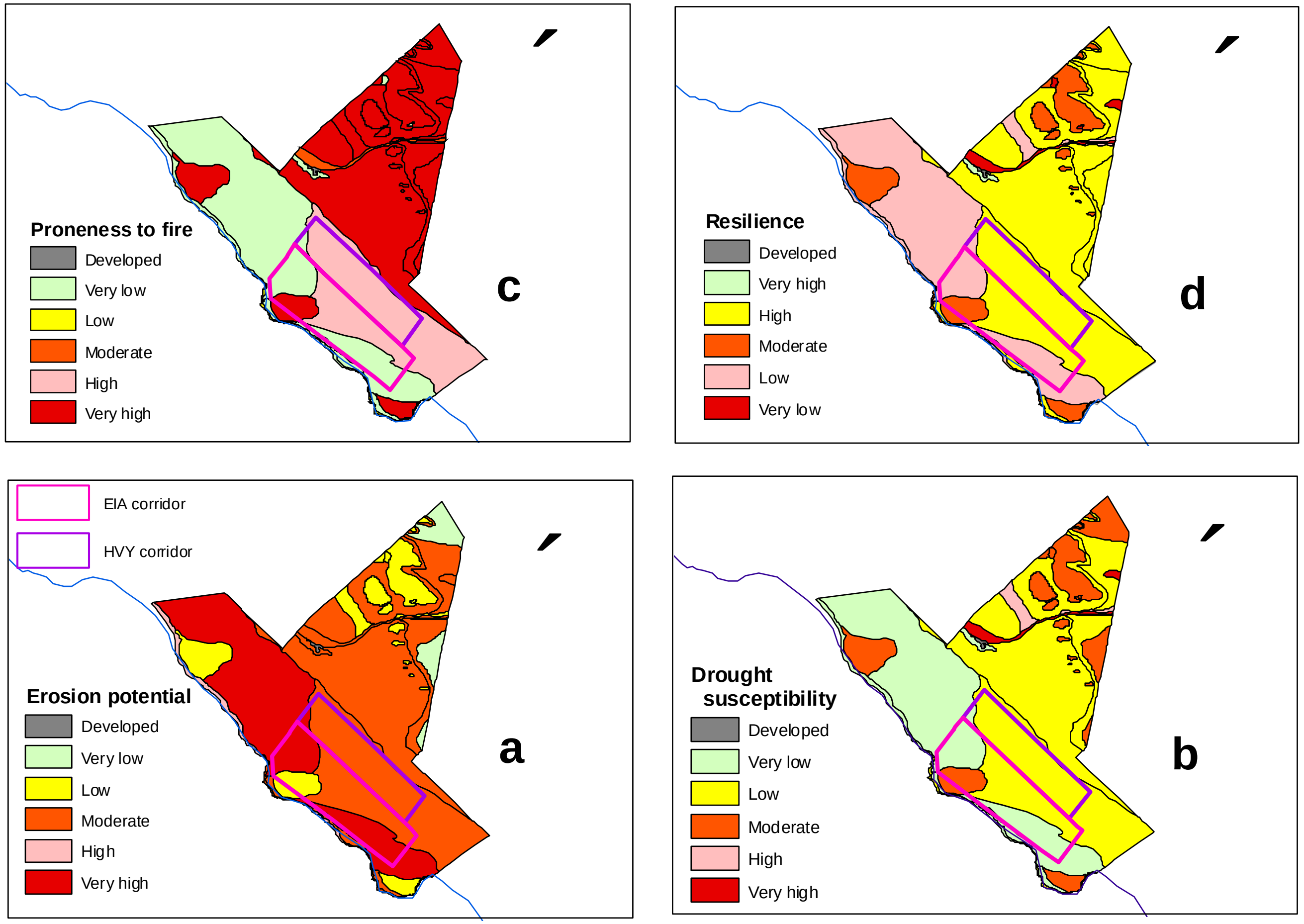
Plant community	Description	Vegetation type	Rarity									Sensitivity					
			Conservation status	No red data species	Veg type	Habitat	Species rarity (%)	Weighted species rarity rating	Species rarity class	Overall rarity rating	Rarity class	Erosion	Droughting	Fire	Resilience	Total sensitivity	Sensitivity class
BK1	Rocky shore vegetation: shallow calcareous sand over sandstone	Cape Seashore Vegetation	LT	1	1	3	4.2	1	2	12	3	3	2	2	3	17	3
BK2 & BK3	Primary & foredune vegetation	Overberg Dune Strandveld	LT	1	1	1	2.9	1	2	6	2	4	1	1	4	16	3
BK4	Dune thicket on transverse dunes	Overberg Dune Strandveld	LT	0	1	1	0.0	0	0	5	1	5	1	1	4	18	3
BK5	Dwarf coastal dune thicket	Overberg Dune Strandveld	LT	6	1	2	6.8	1	3	9	2	3	1	1	2	12	3
BK6	Inland dune thicket on deep calcareous sand	Overberg Dune Strandveld	LT	8	1	1	4.1	1	2	6	2	3	1	1	1	11	3
BK7	Forest on inland limestone	Southern Coastal Forest	LT	0	1	4	0.0	0	0	14	3	2	3	1	5	19	3
BK8	Dune fynbos on deep calcareous sand over limestone	Overberg Dune Strandveld	LT	8	1	2	11.9	2	4	10	2	3	2	4	2	18	3
BK9	Fynbos on coastal limestone	Agulhas Limestone Fynbos	LT	8	1	4	7.4	2	3	16	4	2	3	5	3	21	4
BK10	Fynbos on inland limestone	Agulhas Limestone Fynbos	LT	15	1	4	14.7	4	4	18	3	2	3	5	3	21	4

APPENDIX 4.2.5. CALCULATION OF RARITY & SENSITIVITY AT BANTAMSKLIP

Plant community	Description	Vegetation type	Rarity									Sensitivity					
			Conservation status	No red data species	Veg type	Habitat	Species rarity (%)	Weighted species rarity rating	Species rarity class	Overall rarity rating	Rarity class	Erosion	Droughting	Fire	Resilience	Total sensitivity	Sensitivity class
BK11	Proteoid fynbos on inland sandstone	Overberg Sandstone Fynbos	LT	10	1	2	17.9	2	5	10	2	1	3	5	2	18	3
BK12	Proteoid fynbos on acid sand	Agulhas Sand Fynbos	V	10	2	3	14.1	3	4	16	4	3	2	5	2	19	3
BK13	Berzelia seep fynbos, mainly along Hagelkraal River	Agulhas Sand Fynbos	V	0	2	4	0.0	1	0	17	4	2	4	5	4	25	4
BK14	Proteoid fynbos on neutral sand	Agulhas Sand Fynbos	V	13	1	3	9.8	3	3	14	3	3	2	5	2	19	3
BK15	Wetland off upper Hagelkraal River	Cape Lowland Freshwater Wetlands	V	0	2	5	0.0	0	0	19	4	3	5	5	5	31	5
BK16	Riverine vegetation and longitudinal wetlands of Groot Hagelkraal River	Cape Lowland Freshwater Wetlands	V	0	2	5	0.0	0	0	19	4	3	5	3	5	29	4



Appendix 4.2.6. Rarity at Bantamsklip, showing position of nuclear power station footprints, a: vegetation type; b: habitat; c: species (%); d: species (weighted numbers). Rarity calculated from values in Appendix 4.2.5



Appendix 4.2.7. Ecological sensitivity at Bantamsklip, showing proposed nuclear power station footprints. a: erosion potential; b: susceptibility to droughting; c: proneness to fire; d: plant community resilience. Sensitivity calculated from values in Appendix 4.2.5

APPENDIX 4.3.1. PLANT SPECIES RECORDED FROM THYSPUNT: INDIVIDUAL SITES

NT: Near Threatened; R: Rare, VU: vulnerable EN: Endangered, CR: Critically Endangered

LC: Least Concern; DD: Data Deficient; De: Declining

COMMUNITY T1: ROCKY SHORE

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
Aizoon
rigidum L.f.
Tetragonia
decumbens Mill.
ANACARDIACEAE
Rhus
crenata Thunb.
APIACEAE
Dasispermum
suffruticosum (P.J.Bergius) B.L.Burtt
APOCYNACEAE
Cynanchum
obtusifolium L.f.
ASTERACEAE
Chrysanthemoides
monilifera (L.) Norl.
Cotula
mariae Bremer & Humphries
Disparago
cf. ericoides (P.J.Bergius) Gaertn.
Felicia
amoena (Sch.Bip.) Levyns subsp. latifolia Grau
echinata (Thunb.) Less.
Gazania
rigens (L.) Gaertn.
Helichrysum
cf. crispum (L.) D.Don.
patulum (L.) D.Don.
teretifolium (L.) D.Don.
Metalasia
cf. densa (Lam.) Karis
Senecio
elegans L.
rosmarinifolius L.f.
Syncarpha
sordescens (DC.) B.Nord. VU
BRASSICACEAE
Heliophila
subulata Burch. ex DC.
CARYOPHYLLACEAE
Silene
bellidioides Sond.
cf. primuliflora Eckl. & Zeyh.
CELASTRACEAE
Maytenus
procumbens (L.f.) Loes.
Robsonodendron
cf. maritimum (Bolus) R.H.Archer
CRASSULACEAE
Crassula
expansa Dryand. subsp. expansa
cf. nudicaulis L.
EBENACEAE
Euclea
racemosa Murray
FABACEAE
Indigofera
tomentosa Eckl. & Zeyh.
Lessertia
stenoloba E. Mey.
Psoralea
repens L. NT
GENTIANACEAE
Chironia
cf. tetragona L.f.
MESEMBRYANTHEMACEAE
Carpobrotus
deliciosus (L.Bolus) L.Bolus LC
Delosperma
cf. patersoniae (L.Bolus) L.Bolus
Drosanthemum
cf. hispidum (L.) Schwantes
Mesembryanthemum
splendens L. subsp. splendens
OLEACEAE
Olea
capensis L. subsp. capensis
PLANTAGINACEAE
Plantago
crassifolia Forssk.
PLUMBAGINACEAE
Limonium
scabrum (Thunb.) Kuntze
POLYGALACEAE
Polygala
microlopha DC.
RHAMNACEAE
Phylica
litoralis (Eckl. & Zeyh.) D.Dietr.
RUBIACEAE
Anthospermum
prostratum Sond.
RUTACEAE
Agathosma
apiculata G.Mey.
SANTALACEAE
Osyris
compressa (P.J.Bergius) A.DC.
Thesidium
fragile (Thunb.) Sond.
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme
SCROPHULARIACEAE
Chaenostoma
hispidum (Thunb.) Druce
SOLANACEAE
Solanum
africanum Mill. LC
THYMELAEACEAE
Passerina
rigida Wikstr.
VISCACEAE
Viscum
obscurum Thunb.
ZYGOPHYLLACEAE
Roepera
maritima Sond.

Division: Anthophyta
Class: Monocotyledones

ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
ASPARAGACEAE
Asparagus
aethiopicus L.

COMMUNITY T1: ROCKY SHORE (contd.)

ASPHODELACEAE
  Trachyandra
    cf. ciliata (L.f.) Kunth LC
COLCHICACEAE
  Colchicum
    cf. eucomoides (Jacq.) J.C.Manning & Vinnersten
CYPERACEAE
  Carex
    cf. aethiopica Schkuhr
  Cyperus
    natalensis Hochst.
  Ficinia
    indica (Lam.) Pfeiffer
    lateralis (Vahl) Kunth
HYACINTHACEAE
  Albuca
    cf. cooperi Baker
ORCHIDACEAE
  Bonatea
    speciosa (L.f.) Willd. var. speciosa LC
POACEAE
  Ehrharta
    calycina Sm.
  Sporobolus
    virginicus (L.) Kunth
  Stenotaphrum
    secundatum (Walter) Kuntze
RESTIONACEAE
  Elegia
    microcarpa (Kunth) Pillans

Total named species:	**63**
Total genera:	**56**
Total families:	**36**
Total red data species:	**2**

COMMUNITY T2: PRIMARY DUNES

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
- Tetragonia
  - decumbens Mill.

ANACARDIACEAE
- Rhus
  - glauca Thunb.

APIACEAE
- Dasispermum
  - suffruticosum (P.J.Bergius) B.L.Burtt

APOCYNACEAE
- Cynanchum
  - obtusifolium L.f.

ASTERACEAE
- Arctotheca
  - populifolia (P.J.Bergius) Norl.
- Chrysanthemoides
  - monilifera (L.) Norl.
- Felicia
  - amoena (Sch.Bip.) Levyns subsp. latifolia Grau
- Gazania
  - rigens (L.) Gaertn.
- Helichrysum
  - teretifolium (L.) D.Don.
- Metalasia
  - muricata (L.) D.Don.
- Senecio
  - cf. litorosus Fourc.
- Seriphium
  - plumosum L.
- Syncarpha
  - argentea (Thunb.) B.Nord.

BRASSICACEAE
- Heliophila
  - linearis (Thunb.) DC.

CELASTRACEAE
- Pterocelastrus
  - tricuspidatus (Lam.) Sond. LC
- Robsonodendron
  - maritimum (Bolus) R.H.Archer

CRASSULACEAE
- Crassula
  - cf. pubescens Thunb. subsp. pubescens

FABACEAE
- Tephrosia
  - capensis (Jacq.) Pers.

GOODENIACEAE
- Scaevola
  - cf. plumieri (L.) Vahl

MESEMBRYANTHEMACEAE
- Carpobrotus
  - acinaciformis (L.) L.Bolus LC

MYRICACEAE
- Morella
  - cordifolia (L.) Killick

PLANTAGINACEAE
- Plantago
  - crassifolia Forssk.

SANTALACEAE
- Osyris
  - compressa (P.J.Bergius) A.DC.

SCROPHULARIACEAE
- Hebenstretia
  - cordata L.

SOLANACEAE
- Solanum
  - africanum Mill. LC

THYMELAEACEAE
- Passerina
  - rigida Wikstr.

Division: Anthophyta

Class: Monocotyledones

CYPERACEAE
- Carex
  - cf. aethiopica Schkuhr
- Ficinia
  - lateralis (Vahl) Kunth

POACEAE
- Ehrharta
  - villosa Schult.f.
- Sporobolus
  - virginicus (L.) Kunth

Total named species:	**30**
Total genera:	**30**
Total families:	**19**
Total red data species:	**0**

COMMUNITY T3: TRANSVERSE DUNES

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
Rhus
glauca Thunb.
ASTERACEAE
Cotula
mariae Bremer & Humphries
Disparago
cf. ericoides (P.J.Bergius) Gaertn.
Felicia
amoena (Sch.Bip.) Levyns subsp. latifolia Grau
echinata (Thunb.) Less.
Helichrysum
cymosum (L.) D.Don.
litorale Bolus
Metalasia
muricata (L.) D.Don.
Senecio
cf. pellucidus DC.
rosmarinifolius L.f.
Seriphium
cf. plumosum L.
BRASSICACEAE
Heliophila
subulata Burch. ex DC.
CARYOPHYLLACEAE
Silene
primuliflora Eckl. & Zeyh.
CONVOLVULACEAE
Dichondra
micrantha Urban
CRASSULACEAE
Crassula
tetragona L.
FABACEAE
Otholobium
cf. virgatum (Burm.f.) C.H.Stirt.
Psoralea
repens L. NT
GENTIANACEAE
Chironia
baccifera L.
LINACEAE
Linum
africanum L.
MESEMBRYANTHEMACEAE
Carpobrotus
cf. deliciosus (L.Bolus) L.Bolus LC
MYRICACEAE
Morella
cordifolia (L.) Killick
RUBIACEAE
Anthospermum
cf. aethiopicum L.
SCROPHULARIACEAE
Zaluzianskya
maritima (L.f.) Walp.
THYMELAEACEAE
Passerina
cf. rigida Wikstr.

Division: Anthophyta

Class: Monocotyledones

CYPERACEAE
Cyperus
natalensis Hochst.
Ficinia
lateralis (Vahl) Kunth
nodosa (Rottb.) Goetgh.
IRIDACEAE
Aristea
ecklonii Baker
ORCHIDACEAE
Disa
chrysostachya Sw.
Eulophia
speciosa (R.Br. ex Lindl.) Bolus De
POACEAE
Ehrharta
villosa Schult.f. var. maxima
Merxmuellera
cincta (Nees) Conert subsp. sericea N.P.Barker VU

Total named species:	**32**
Total genera:	**28**
Total families:	**18**
Total red data species:	**3**

COMMUNITY T4: COASTAL DWARF THICKET

Division: Anthophyta

Class: Dicotyledones

AIZOACEAE
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
crenata Thunb.
glauca Thunb.
laevigata L.f.
lucida L. forma scoparia (Eckl. & Zeyh.) Moffett
APOCYNACEAE
Carissa
bispinosa (L.) Desf. ex Brenan
Secamone
alpini Schult.
ARALIACEAE
Cussonia
cf. thyrsiflora Thunb.
ASTERACEAE
Chrysanthemoides
monilifera (L.) Norl.
Disparago
cf. ericoides (P.J.Bergius) Gaertn.
Helichrysum
teretifolium (L.) D.Don.
Metalasia
muricata (L.) D.Don.
BRASSICACEAE
Lepidium
africanum (Burm.f.) DC.
CELASTRACEAE
Cassine
peragua L.
Lauridia
tetragona (L.f.) R.H.Archer
Maytenus
procumbens (L.f.) Loes.
Mystroxylon
aethiopicum (Thunb.) Loes.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Putterlickia
pyracantha (L.) Szyszyl.
CUCURBITACEAE
Kedrostis
cf. nana (Lam.) Cogn.
EBENACEAE
Euclea
racemosa Murray
FABACEAE
Rhynchosia
caribaea (Jacq.) DC.
GENTIANACEAE
Chironia
baccifera L.
GERANIACEAE
Pelargonium
capitatum (L.) L'Hér.
MENISPERMACEAE
Cissampelos
capensis L.f.
OLEACEAE
Chionanthus
foveolatus (E.Mey.) Stearn subsp. foveolatus
Olea
capensis L. subsp. capensis
exasperata Jacq.
RUBIACEAE
Psydrax
obovata Eckl. & Zeyh. subsp. obovata
RUTACEAE
Agathosma
apiculata G.Mey.
SANTALACEAE
Osyris
compressa (P.J.Bergius) A.DC.
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme
THYMELAEACEAE
Passerina
corymbosa Eckl. ex C.H.Wright
rigida Wikstr.
VITACEAE
Rhoicissus
digitata (L.f.) Gilg & M.Brandt

Division: Anthophyta
Class: Monocotyledones

ASPARAGACEAE
Asparagus
aethiopicus L.
africanus Lam.
CYPERACEAE
Ficinia
ramosissima Kunth
IRIDACEAE
Chasmanthe
aethiopica (L.) N.E.Br.
ORCHIDACEAE
Bonatea
cf. speciosa (L.f.) Willd. var. speciosa LC
POACEAE
Ehrharta
villosa Schult.f. var. villosa
RESTIONACEAE
Ischyrolepis
leptoclados (Mast.) H.P.Linder

Total named species:	**42**
Total genera:	**36**
Total families:	**26**
Total red data species:	**0**

COMMUNITY T5: TALL THICKET

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
 Rhus
  crenata Thunb.
  glauca Thunb.
  cf. laevigata L.f.
APOCYNACEAE
 Carissa
  bispinosa (L.) Desf. ex Brenan
 Cynanchum
  obtusifolium L.f.
ARALIACEAE
 Centella
  hermanniifolia (Eckl. & Zeyh.) Domin
 Cussonia
  cf. thyrsiflora Thunb.
ASTERACEAE
 Cineraria
  erodioides DC.
 Helichrysum
  cf. cymosum (L.) D.Don.
 Tarchonanthus
  camphoratus L.
BRASSICACEAE
 Capparis
  cf. sepiaria L.
CELASTRACEAE
 Cassine
  peragua L.
 Lauridia
  tetragona (L.f.) R.H.Archer
 Maytenus
  procumbens (L.f.) Loes.
 Mystroxylon
  aethiopicum (Thunb.) Loes.
 Pterocelastrus
  tricuspidatus (Lam.) Sond. LC
CUCURBITACEAE
 Zehneria
  scabra (L.f.) Sond. subsp. scabra
EBENACEAE
 Diospyros
  simii (Kuntze) De Winter
 Euclea
  racemosa Murray
EUPHORBIACEAE
 Adenocline
  acuta (Thunb.) Baill.
FLACOURTIACEAE
 Dovyalis
  cf. rhamnoides (Burch. ex DC.) Burch. & Harv.
MALVACEAE
 Grewia
  occidentalis L.
MYRSINACEAE
 Rapanea
  gilliana (Sond.) Mez EN
OLEACEAE
 Chionanthus
  foveolatus (E.Mey.) Stearn subsp. foveolatus
 Olea
  exasperata Jacq.
POLYGALACEAE
 Polygala
  myrtifolia L.
RHAMNACEAE
 Scutia
  myrtina (Burm.f.) Kurz
RUBIACEAE
 Canthium
  spinosum (Klotzsch) Kuntze
RUTACEAE
 Zanthoxylum
  capense (Thunb.) Harv. LC
SALVADORACEAE
 Azima
  tetracantha Lam.
SANTALACEAE
 Osyris
  compressa (P.J.Bergius) A.DC.
SAPOTACEAE
 Sideroxylon
  inerme L. subsp. inerme
SOLANACEAE
 Solanum
  cf. africanum Mill. LC
  cf. linnaeanum Hepper & E.Jaeger
URTICACEAE
 Droguetia
  iners (Forssk.) Schweinf.
VITACEAE
 Cyphostemma
  cirrhosum (Thunb.) Desc. ex Wild & R.B.Drumm.
 Rhoicissus
  tridentata (L.f.) Wild & R.B.Drumm. LC

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
 Scadoxus
  cf. puniceus (L.) Friis & Nordal
ASPARAGACEAE
 Asparagus
  cf. aethiopicus L.
  cf. asparagoides (L.) Druce
BEHNIACEAE
 Behnia
  cf. reticulata (Thunb.) Didr.
IRIDACEAE
 Melasphaerula
  cf. ramosa (L.) N.E.Br.
ORCHIDACEAE
 Bonatea
  speciosa (L.f.) Willd. var. speciosa LC
POACEAE
 Ehrharta
  erecta Lam.

Total named species:	**44**
Total genera:	**40**
Total families:	**29**
Total red data species:	**1**

COMMUNITY T6: FOREST

Division: Anthophyta

Class: Dicotyledones

ACHARIACEAE
Ceratiosicyos
laevis (Thunb.) A.Meeuse
AMARANTHACEAE
Pupalia
lappacea (L.) A.Juss.
ANACARDIACEAE
Rhus
glauca Thunb.
APOCYNACEAE
Carissa
bispinosa (L.) Desf. ex Brenan
Cynanchum
obtusifolium L.f.
Secamone
alpini Schult.
ARALIACEAE
Cussonia
thyrsiflora Thunb.
BRASSICACEAE
Capparis
sepiaria L.
CELASTRACEAE
Cassine
peragua L.
Gymnosporia
buxifolia (L.) Szyszyl.
Mystroxylon
aethiopicum (Thunb.) Loes.
Putterlickia
pyracantha (L.) Szyszyl.
CUCURBITACEAE
Kedrostis
nana (Lam.) Cogn.
Zehneria
scabra (L.f.) Sond. subsp. scabra
EBENACEAE
Diospyros
simii (Kuntze) De Winter
EUPHORBIACEAE
Leidesia
procumbens (L.) Prain
FLACOURTIACEAE
Dovyalis
rhamnoides (Burch. ex DC.) Burch. & Harv.
Scolopia
zeyheri (Nees) Harv.
Trimeria
trinervis Harv.
ICACINACEAE
Apodytes
dimidiata E.Mey. ex Arn. subsp. dimidiata
MALVACEAE
Grewia
occidentalis L.
OLEACEAE
Chionanthus
foveolatus (E.Mey.) Stearn subsp. foveolatus
Olea
capensis L. subsp. capensis
OXALIDACEAE
Oxalis
incarnata L.
RANUNCULACEAE
Clematis
brachiata Thunb.
RHAMNACEAE
Scutia
myrtina (Burm.f.) Kurz
RUBIACEAE
Canthium
spinosum (Klotzsch) Kuntze
RUTACEAE
Clausena
anisata (Willd.) Hook.f. ex Benth.
Zanthoxylum
capense (Thunb.) Harv. LC
SALVADORACEAE
Azima
tetracantha Lam.
SANTALACEAE
Rhoiacarpos
capensis (Harv.) A.DC.
SAPINDACEAE
Allophylus
decipiens (Sond.) Radlk.
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme
VISCACEAE
Viscum
obscurum Thunb.
VITACEAE
Cyphostemma
cirrhosum (Thunb.) Desc. ex Wild & R.B.Drumm.
Rhoicissus
digitata (L.f.) Gilg & M.Brandt

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Scadoxus
puniceus (L.) Friis & Nordal
ASPARAGACEAE
Asparagus
africanus Lam.
cf. virgatus Baker
DIOSCOREACEAE
Dioscorea
sylvatica (Kunth) Eckl. VU
POACEAE
Ehrharta
erecta Lam.
Panicum
cf. maximum Jacq.

Total named species:	**42**
Total genera:	**41**
Total families:	**29**
Total red data species:	**1**

COMMUNITY T7: DUNE FYNBOS

Division: Anthophyta

Class: Dicotyledones

APIACEAE
Sonderina
caruifolia (Sond.) H.Wolff DD
ASPLENIACEAE
Asplenium
rutifolium (P. J. Bergius) Kunze
GERANIACEAE
Pelargonium
suburbanum Clifford ex C.Boucher subsp. suburbanum VU
AIZOACEAE
Aizoon
rigidum L.f.
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
crenata Thunb.
glauca Thunb.
laevigata L.f.
lucida L. forma scoparia (Eckl. & Zeyh.) Moffett
APIACEAE
Dasispermum
suffruticosum (P.J.Bergius) B.L.Burtt
APOCYNACEAE
Astephanus
marginatus Decne.
Carissa
bispinosa (L.) Desf. ex Brenan
Secamone
alpini Schult.
ARALIACEAE
Centella
hermanniifolia (Eckl. & Zeyh.) Domin
tridentata (L.f.) Drude ex Domin subsp. hermannifolia (Eckl. & Zeyh.) M.T.R.Schubert & B.-E,van Wyk
Cussonia
thyrsiflora Thunb.
ASTERACEAE
Arctotis
elongata Thunb.
Cotula
sericea DC.
Disparago
cf. ericoides (P.J.Bergius) Gaertn.
Felicia
cf. amelloides (L.) Voss
amoena (Sch.Bip.) Levyns subsp. latifolia Grau
echinata (Thunb.) Less.
Gazania
cf. krebsiana Less.
linearis (Thunb.) Druce var. linearis
Helichrysum
cf. crispum (L.) D.Don.
cf. cymosum (L.) D.Don.
litorale Bolus
petiolare Hilliard & B.L.Burtt
cf. praecinctum Klatt
teretifolium (L.) D.Don.
Metalasia
muricata (L.) D.Don.
Othonna
cylindrica (Lam.) DC.
rufibarbis Harv. Th
Senecio
elegans L.
pellucidus DC.
Syncarpha
argentea (Thunb.) B.Nord.
Ursinia
anthemoides (L.) Poir.
BRASSICACEAE
Heliophila
subulata Burch. ex DC.
Lepidium
africanum (Burm.f.) DC.
CARYOPHYLLACEAE
Silene
primuliflora Eckl. & Zeyh.
CELASTRACEAE
Cassine
peragua L.
Lauridia
tetragona (L.f.) R.H.Archer
Maytenus
procumbens (L.f.) Loes.
Mystroxylon
aethiopicum (Thunb.) Loes.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Putterlickia
pyracantha (L.) Szyszyl.
Robsonodendron
maritimum (Bolus) R.H.Archer
CRASSULACEAE
Cotyledon
orbiculata L.
Crassula
expansa Dryand. subsp. expansa
nudicaulis L.
pubescens Thunb. subsp. pubescens
EBENACEAE
Euclea
cf. natalensis A.DC.
racemosa Murray
ERICACEAE
Erica
chloroloma Lindl.
glumiflora Klotzsch ex Benth VU
FABACEAE
Dipogon
lignosus (L.) Verdc.
Indigofera
heterophylla Thunb.
stricta L.f.
zeyheri Spreng. ex Eckl. & Zeyh.
Lessertia
stenoloba E. Mey.
Otholobium
cf. virgatum (Burm.f.) C.H.Stirt.
Rhynchosia
caribaea (Jacq.) DC.
ciliata (Thunb.) Schinz
Tephrosia
capensis (Jacq.) Pers.
GENTIANACEAE
Chironia
baccifera L.
GERANIACEAE
Pelargonium
capitatum (L.) L'Hér.
grossularioides (L.) L'Hér.

COMMUNITY T7: DUNE FYNBOS (contd.)

LAURACEAE
  Cassytha
    ciliolata Nees
LINACEAE
  Linum
    africanum L.
MESEMBRYANTHEMACEAE
  Carpobrotus
    acinaciformis (L.) L.Bolus LC
    deliciosus (L.Bolus) L.Bolus LC
  Delosperma
    patersoniae (L.Bolus) L.Bolus
  Mesembryanthemum
    canaliculatum Haw.
MOLLUGINACEAE
  Pharnaceum
    dichotomum L.f.
MYRICACEAE
  Morella
    cordifolia (L.) Killick
    quercifolia (L.) Killick
MYRSINACEAE
  Rapanea
    gilliana (Sond.) Mez EN
OLEACEAE
  Olea
    capensis L. subsp. capensis
    exasperata Jacq.
PLUMBAGINACEAE
  Limonium
    scabrum (Thunb.) Kuntze
    sp. nov. ABL 15508
POLYGALACEAE
  Muraltia
    squarrosa (L.f.) DC.
  Polygala
    ericaefolia DC.
    cf. myrtifolia L.
RANUNCULACEAE
  Knowltonia
    capensis (L.) Huth
RHAMNACEAE
  Phylica
    litoralis (Eckl. & Zeyh.) D.Dietr.
  Scutia
    myrtina (Burm.f.) Kurz
ROSACEAE
  Cliffortia
    filifolia L.f.
RUBIACEAE
  Anthospermum
    aethiopicum L.
    prostratum Sond.
    cf. spathulatum Spreng.
  Psydrax
    obovata Eckl. & Zeyh. subsp. obovata
RUTACEAE
  Agathosma
    apiculata G.Mey.
    stenopetala (Steud.) Steud. VU
SANTALACEAE
  Osyris
    compressa (P.J.Bergius) A.DC.
  Thesidium
    fragile (Thunb.) Sond.
  Thesium
    commutatum Sond.
SAPOTACEAE
  Sideroxylon
    inerme L. subsp. inerme
SCROPHULARIACEAE
  Chaenostoma
    campanulatum (Benth.) Kuntze LC
    hispidum (Thunb.) Druce
  Dischisma
    ciliatum (P.J.Bergius) Choisy
  Jamesbrittenia
    microphylla (L.f.) Hilliard
  Zaluzianskya
    maritima (L.f.) Walp.
SOLANACEAE
  Solanum
    africanum Mill. LC
THYMELAEACEAE
  Passerina
    rigida Wikstr.
  Struthiola
    argentea Lehm.
VITACEAE
  Rhoicissus
    digitata (L.f.) Gilg & M.Brandt
ZYGOPHYLLACEAE
  Roepera
    maritima Sond.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
  Boophone
    cf. disticha (L.f.) Herb. De
  Brunsvigia
    gregaria R.A.Dyer
  Cyrtanthus
    loddigesianus (Herb.) R.A.Dyer LC
ASPARAGACEAE
  Asparagus
    aethiopicus L.
    africanus Lam.
    racemosus Willd.
ASPHODELACEAE
  Gasteria
    cf. acinacifolia (Jacq.) Haw.
COLCHICACEAE
  Colchicum
    cf. eucomoides (Jacq.) J.C.Manning & Vinnersten
CYPERACEAE
  Ficinia
    bulbosa (L.) Nees
    dunensis Levyns
    indica (Lam.) Pfeiffer
    ramosissima Kunth
  Isolepis
    marginata (Thunb.) A.Dietr.
  Tetraria
    brachyphylla Levyns NT
    cf. cuspidata (Rottb.) C.B.Clarke
HAEMODORACEAE
  Wachendorfia
    paniculata Burm.

COMMUNITY T7: DUNE FYNBOS (contd.)

HYACINTHACEAE
  Albuca
    cf. cooperi Baker
IRIDACEAE
  Chasmanthe
    aethiopica (L.) N.E.Br.
  Gladiolus
    floribundus Jacq.
ORCHIDACEAE
  Bonatea
    cf. speciosa (L.f.) Willd. var. speciosa LC
  Holothrix
    villosa Lindl.
POACEAE
  Ehrharta
    calycina Sm.
  Imperata
    cylindrica (L.) Raeuschel
  Pentaschistis
    cf. pallida (Thunb.) H.P.Linder LC
  Sporobolus
    virginicus (L.) Kunth
  Tribolium
    hispidum (Thunb.) Desv.
RESTIONACEAE
  Elegia
    microcarpa (Kunth) Pillans
  Ischyrolepis
    eleocharis (Nees ex Mast.) H.P.Linder
    leptoclados (Mast.) H.P.Linder

Total named species:	**137**
Total genera:	**98**
Total families:	**48**
Total red data species:	**7**

COMMUNITY T8: COASTAL LIMESTONE

Division: Anthophyta
Class: Dicotyledones

AIZOACEAE
Aizoon
rigidum L.f.
Tetragonia
fruticosa L.
ANACARDIACEAE
Rhus
crenata Thunb.
glauca Thunb.
lucida L. forma scoparia (Eckl. & Zeyh.) Moffett
APOCYNACEAE
Astephanus
marginatus Decne.
Carissa
bispinosa (L.) Desf. ex Brenan
Cynanchum
obtusifolium L.f.
ARALIACEAE
Cussonia
thyrsiflora Thunb.
ASTERACEAE
Cotula
mariae Bremer & Humphries
Felicia
amoena (Sch.Bip.) Levyns subsp. latifolia Grau
echinata (Thunb.) Less.
Gazania
linearis (Thunb.) Druce var. linearis
Helichrysum
teretifolium (L.) D.Don.
Metalasia
muricata (L.) D.Don.
Othonna
cylindrica (Lam.) DC.
rufibarbis Harv. Th
Senecio
elegans L.
pellucidus DC.
BRASSICACEAE
Heliophila
cf. subulata Burch. ex DC.
CELASTRACEAE
Lauridia
tetragona (L.f.) R.H.Archer
Maytenus
procumbens (L.f.) Loes.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Robsonodendron
maritimum (Bolus) R.H.Archer
CONVOLVULACEAE
Falkia
repens L.f.
CRASSULACEAE
Cotyledon
orbiculata L.
Crassula
expansa Dryand. subsp. expansa
nudicaulis L.
DIPSACACEAE
Scabiosa
columbaria L. LC
ERICACEAE
Erica
glumiflora Klotzsch ex Benth VU
FABACEAE
Indigofera
stricta L.f.
tomentosa Eckl. & Zeyh.
Lessertia
stenoloba E. Mey.
Otholobium
cf. virgatum (Burm.f.) C.H.Stirt.
Psoralea
repens L. NT
FLACOURTIACEAE
Dovyalis
rotundifolia (Thunb.) Thunb. & Harv.
GENTIANACEAE
Chironia
baccifera L.
GERANIACEAE
Pelargonium
cf. suburbanum Clifford ex C.Boucher subsp.
suburbanum VU
LINACEAE
Linum
africanum L.
MESEMBRYANTHEMACEAE
Carpobrotus
deliciosus (L.Bolus) L.Bolus LC
Delosperma
patersoniae (L.Bolus) L.Bolus
MYRICACEAE
Morella
cordifolia (L.) Killick
OLEACEAE
Olea
exasperata Jacq.
PLUMBAGINACEAE
Limonium
scabrum (Thunb.) Kuntze
sp. nov. ABL 15508
POLYGALACEAE
Polygala
ericaefolia DC.
RHAMNACEAE
Phylica
litoralis (Eckl. & Zeyh.) D.Dietr.
Scutia
myrtina (Burm.f.) Kurz
RUBIACEAE
Anthospermum
prostratum Sond.
Psydrax
obovata Eckl. & Zeyh. subsp. obovata
RUTACEAE
Agathosma
apiculata G.Mey.
SANTALACEAE
Osyris
compressa (P.J.Bergius) A.DC.
Thesidium
fragile (Thunb.) Sond.
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme

COMMUNITY T8: COASTAL LIMESTONE (contd.)

SCROPHULARIACEAE
Chaenostoma
campanulatum (Benth.) Kuntze LC
Jamesbrittenia
microphylla (L.f.) Hilliard
Zaluzianskya
maritima (L.f.) Walp.
THYMELAEACEAE
Passerina
corymbosa Eckl. ex C.H.Wright
rigida Wikstr.
VITACEAE
Rhoicissus
tridentata (L.f.) Wild & R.B.Drumm. LC
ZYGOPHYLLACEAE
Roepera
maritima Sond.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Brunsvigia
gregaria R.A.Dyer
ASPARAGACEAE
Asparagus
cf. aethiopicus L.
racemosus Willd.
ASPHODELACEAE
Gasteria
acinacifolia (Jacq.) Haw.
CYPERACEAE
Ficinia
lateralis (Vahl) Kunth
ramosissima Kunth
HAEMODORACEAE
Wachendorfia
paniculata Burm.
HYACINTHACEAE
Albuca
cf. cooperi Baker
IRIDACEAE
Gladiolus
floribundus Jacq.
ORCHIDACEAE
Satyrium
princeps Bolus VU
POACEAE
Ehrharta
calycina Sm.
RESTIONACEAE
Elegia
microcarpa (Kunth) Pillans
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder

Total named species:	**74**
Total genera:	**63**
Total families:	**40**
Total red data species:	**5**

COMMUNITY T9: SANDSTONE

Division: Pteridophyta

SCHIZAEACEAE
  Schizaea
    cf. pectinata (L.) Sw.

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
  Rhus
    lucida L.
APIACEAE
  Alepidea
    cf. delicatula Weim. Ra
APOCYNACEAE
  Microloma
    tenuifolium (L.) K.Schum.
ASTERACEAE
  Aster
    cf. bakerianus Burtt Davy ex C.A.Sm.
  Dicerothamnus
    rhinocerotis (DC.) Koekemoer
  Disparago
    ericoides (P.J.Bergius) Gaertn.
  Euryops
    munitus (L.f.) B.Nord.
  Helichrysum
    cf. anomalum Less.
    cymosum (L.) D.Don.
    felinum Less.
    teretifolium (L.) D.Don.
  Pteronia
    teretifolia (Thunb.) Fourc.
  Senecio
    oederiifolius DC.
  Seriphium
    cinereum L.
    plumosum L.
BRASSICACEAE
  Heliophila
    subulata Burch. ex DC.
CRASSULACEAE
  Crassula
    subulata L. var. fastigiata
    tetragona L.
DIPSACACEAE
  Scabiosa
    columbaria L. LC
ERICACEAE
  Erica
    discolor Andrews
    cf. pectinifolia Salisb.
    sessiliflora L.f.
    sparmannii L.f.
EUPHORBIACEAE
  Clutia
    alaternoides L.
FABACEAE
  Indigofera
    sulcata DC.
  Rhynchosia
    capensis (Burm.f.) Schinz
MALVACEAE
  Hermannia
    cf. saccifera (Turcz.) K.Schum.
  Hibiscus
    cf. aethiopicus L.
OXALIDACEAE
  Oxalis
    polyphylla Jacq.
    cf. purpurea L.
POLYGALACEAE
  Polygala
    microlopha DC.
PROTEACEAE
  Leucadendron
    salignum P.J.Bergius LC
  Protea
    neriifolia R.Br. LC
RHAMNACEAE
  Phylica
    gnidioides Eckl. & Zeyh.
ROSACEAE
  Cliffortia
    paucistaminea Weim.
RUBIACEAE
  Anthospermum
    prostratum Sond.
RUTACEAE
  Agathosma
    sp. nov. ABL 15400
THYMELAEACEAE
  Gnidia
    stypheloides Meisn.

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
  Tetraria
    cf. bromoides (Lam.) Pfeiffer
HEMEROCALLIDACEAE
  Caesia
    contorta (L.f.) T.Durand & Schinz
HYACINTHACEAE
  Drimia
    cf. hesperantha J.C.Manning & Goldblatt
  Ornithogalum
    graminifolium Thunb.
IRIDACEAE
  Tritoniopsis
    cf. caffra (Ker Gawl. ex Baker) Goldblatt
LANARIACEAE
  Lanaria
    lanata (L.) T.Durand & Schinz
ORCHIDACEAE
  Satyrium
    cf. membranaceum Sw.
    cf. parviflorum Sw.
POACEAE
  Pentaschistis
    pallida (Thunb.) H.P.Linder LC
RESTIONACEAE
  Hypodiscus
    striatus (Kunth) Mast.
  Restio
    triticeus Rottb.
  Thamnochortus
    cf. fruticosus P.J.Bergius

COMMUNITY T9: SANDSTONE (contd.)

Total named species:	**51**
Total genera:	**41**
Total families:	**28**
Total red data species:	**1**

COMMUNITY T10A: COASTAL WETLAND

Division: Anthophyta

Class: Dicotyledones

ACANTHACEAE
Barleria
cf. obtusa Nees
Hypoestes
aristata (Vahl.) Sol. ex Roem. & Schult.
ANACARDIACEAE
Rhus
crenata Thunb.
glauca Thunb.
laevigata L.f.
APOCYNACEAE
Cynanchum
natalitium Schltr.
ARALIACEAE
Cussonia
thyrsiflora Thunb.
ASTERACEAE
Cullumia
decurrens Less.
Disparago
cf. ericoides (P.J.Bergius) Gaertn.
Helichrysum
cymosum (L.) D.Don.
gymnocomum DC.
Nidorella
auriculata DC.
Senecio
halimifolius L.
lanceus Aiton
Syncarpha
sordescens (DC.) B.Nord. VU
BRASSICACEAE
Lepidium
cf. africanum (Burm.f.) DC.
CAMPANULACEAE
Lobelia
anceps L.f.
CELASTRACEAE
Lauridia
tetragona (L.f.) R.H.Archer
CUCURBITACEAE
Zehneria
scabra (L.f.) Sond. subsp. scabra
EUPHORBIACEAE
Clutia
affinis Sond.
FABACEAE
Indigofera
mollis Eckl. & Zeyh.
GENTIANACEAE
Chironia
peduncularis Lindl.
cf. serpyllifolia Lehm.
GERANIACEAE
Geranium
ornithopodon Eckl. & Zeyh.
Pelargonium
capitatum (L.) L'Hér.
grossularioides (L.) L'Hér.
LAMIACEAE
Mentha
cf. aquatica L.
MESEMBRYANTHEMACEAE
Carpobrotus
cf. deliciosus (L.Bolus) L.Bolus LC
OLEACEAE
Olea
capensis L. subsp. capensis
POLYGONACEAE
Persicaria
attenuata (R.Br.) Soják subsp. africana K.L.Wilson
Rumex
lanceolatus Thunb.
RHAMNACEAE
Scutia
myrtina (Burm.f.) Kurz
RUBIACEAE
Anthospermum
herbaceum L.f.
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme
SCROPHULARIACEAE
Veronica
anagallis-aquatica L.
SOLANACEAE
Solanum
africanum Mill. LC
THYMELAEACEAE
Passerina
rigida Wikstr.
VITACEAE
Rhoicissus
tridentata (L.f.) Wild & R.B.Drumm. LC

Division: Anthophyta
Class: Monocotyledones

ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
ASPARAGACEAE
Asparagus
africanus Lam.
ASPHODELACEAE
Kniphofia
cf. rooperi (T.Moore) Lem. LC
CYPERACEAE
Carex
aethiopica Schkuhr
Cyperus
cf. longus L.
thunbergii Vahl
Ficinia
nodosa (Rottb.) Goetgh.
Isolepis
prolifera R.Br.
JUNCACEAE
Juncus
cf. kraussii Hochst. subsp. kraussii LC
lomatophyllus Spreng.
POACEAE
Ehrharta
cf. erecta Lam.
Imperata
cylindrica (L.) Raeuschel
Phragmites
australis (Cav.) Trin. ex Steud.

T10A: COASTAL WETLAND (contd.)

TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species:	**52**
Total genera:	**44**
Total families:	**31**
Total red data species:	**1**

T10B: LANGEFONTEIN WETLAND

Division: Pteridophyta

THELYPTERIDACEAE
- Thelypteris
  - cf. confluens (Thunb.) C.V.Morton

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
- Rhus
  - laevigata L.f.
  - lucida L. forma lucida
  - lucida L. forma scoparia (Eckl. & Zeyh.) Moffett
  - undulata Jacq.

APIACEAE
- Berula
  - erecta (Huds.) Coville subsp. thunbergii (DC.) B.L.Burtt
- Peucedanum
  - capense (Thunb.) Sond.

APOCYNACEAE
- Gomphocarpus
  - fruticosus (L.) Aiton

ARALIACEAE
- Cussonia
  - thyrsiflora Thunb.

ASTERACEAE
- Felicia
  - aethiopica (Burm.f.) Adamson & T.M.Salter
- Helichrysum
  - cymosum (L.) D.Don.
  - gymnocomum DC.
- Nidorella
  - auriculata DC.
- Senecio
  - halimifolius L.
  - lanceus Aiton
  - purpureus L.

CAMPANULACEAE
- Lobelia
  - anceps L.f.

CELASTRACEAE
- Pterocelastrus
  - tricuspidatus (Lam.) Sond. LC

CUCURBITACEAE
- Zehneria
  - scabra (L.f.) Sond. subsp. scabra

EUPHORBIACEAE
- Clutia
  - cf. daphnoides Lam.
- Euphorbia
  - epicyparissias E.Mey. ex Boiss.

FABACEAE
- Indigofera
  - mollis Eckl. & Zeyh.
- Psoralea
  - sp. nov. ABL 15269

GENTIANACEAE
- Chironia
  - peduncularis Lindl.
  - tetragona L.f.

GERANIACEAE
- Geranium
  - ornithopodon Eckl. & Zeyh.

LAMIACEAE
- Leonotis
  - leonurus (L.) R.Br.
- Mentha
  - aquatica L.

MENISPERMACEAE
- Cissampelos
  - capensis L.f.

MYRICACEAE
- Morella
  - quercifolia (L.) Killick
  - serrata (Lam.) Killick

ONAGRACEAE
- Epilobium
  - capense Buchinger ex Hochst.

OROBANCHACEAE
- Harveya
  - cf. purpurea (L.f.) Harv. ex Hook.
- Melasma
  - scabrum P.J. Bergius

POLYGALACEAE
- Polygala
  - virgata Thunb.

POLYGONACEAE
- Persicaria
  - attenuata (R.Br.) Soják subsp. africana K.L.Wilson
- Rumex
  - lanceolatus Thunb.

RHAMNACEAE
- Rhamnus
  - prinoides L'Her.

SCROPHULARIACEAE
- Selago
  - canescens L.f.
- Veronica
  - anagallis-aquatica L.

SOLANACEAE
- Solanum
  - africanum Mill. LC

VITACEAE
- Cyphostemma
  - cirrhosum (Thunb.) Desc. ex Wild & R.B.Drumm.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
- Scadoxus
  - cf. puniceus (L.) Friis & Nordal

ARACEAE
- Zantedeschia
  - aethiopica (L.) Spreng.

ASPARAGACEAE
- Asparagus
  - asparagoides (L.) Druce

ASPHODELACEAE
- Kniphofia
  - cf. rooperi (T.Moore) Lem. LC

CYPERACEAE
- Carex
  - aethiopica Schkuhr
- Cladium
  - mariscus (L.) Pohl subsp. jamaicense (Crantz) Kuekenth.
- Cyperus
  - thunbergii Vahl

COMMUNITY T10B LANGEFONTEIN WETLAND (contd.)

Fuirena
cf. coerulescens Steud.
Isolepis
prolifera R.Br.
Neesenbeckia
punctoria (Vahl) Levyns
Tetraria
cf. cuspidata (Rottb.) C.B.Clarke
JUNCACEAE
Juncus
lomatophyllus Spreng.
POACEAE
Phragmites
australis (Cav.) Trin. ex Steud.
TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species:	**56**
Total genera:	**48**
Total families:	**32**
Total red data species:	**0**

COMMUNITY T10C: TRANSVERSE DUNE WETLANDS

Division: Anthophyta

Class: Dicotyledones

APIACEAE
- Berula
  - erecta (Huds.) Coville subsp. thunbergii (DC.) B.L.Burtt

ARALIACEAE
- Centella
  - asiatica (L.) Urban

ASTERACEAE
- Helichrysum
  - cf. cymosum (L.) D.Don.
  - litorale Bolus
- Plecostachys
  - serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
- Senecio
  - lanceus Aiton
  - leptophyllus DC.
  - cf. rosmarinifolius L.f.
- Seriphium
  - plumosum L.
- Vellereophyton
  - vellereum (R.A.Dyer) Hilliard

BRASSICACEAE
- Heliophila
  - linearis (Thunb.) DC.

CAMPANULACEAE
- Lobelia
  - anceps L.f.
- Monopsis
  - unidentata (Dryand. ex Aiton) E.Wimm.

FABACEAE
- Psoralea
  - repens L. NT

GENTIANACEAE
- Chironia
  - decumbens Levyns
  - tetragona L.f.
- Sebaea
  - minutiflora Schinz

GERANIACEAE
- Pelargonium
  - grossularioides (L.) L'Hér.

LENTIBULARIACEAE
- Utricularia
  - cf. bisquamata Schrank

MYRICACEAE
- Morella
  - cordifolia (L.) Killick

OROBANCHACEAE
- Alectra
  - sessiliflora (Vahl) Kuntze

Division: Anthophyta

Class: Monocotyledones

CYPERACEAE
- Bolboschoenus
  - cf. maritimus (L.) Palla
- Ficinia
  - lateralis (Vahl) Kunth
  - nodosa (Rottb.) Goetgh.
- Fuirena
  - coerulescens Steud.
  - hirsuta (P.J.Bergius) P.L.Forbes
- Isolepis
  - cernua (Vahl) Roem. & Schult.
  - rubicunda Kunth
- Scirpoides
  - thunbergii (Schrad.) Soják

IRIDACEAE
- Aristea
  - ecklonii Baker

JUNCACEAE
- Juncus
  - capensis Thunb.
  - kraussii Hochst. subsp. kraussii LC

JUNCAGINACEAE
- Triglochin
  - striata Ruiz & Pav.

ORCHIDACEAE
- Acrolophia
  - cochlearis (Lindl.) Schltr. & Bolus
- Disa
  - chrysostachya Sw.
- Eulophia
  - speciosa (R.Br. ex Lindl.) Bolus De
- Satyrium
  - hallackii Bolus subsp. hallackii EN

POACEAE
- Imperata
  - cylindrica (L.) Raeuschel
- Merxmuellera
  - cincta (Nees) Conert subsp. sericea N.P.Barker VU
- Polypogon
  - strictus Nees
- Sporobolus
  - virginicus (L.) Kunth

RESTIONACEAE
- Elegia
  - microcarpa (Kunth) Pillans

TYPHACEAE
- Typha
  - capensis (Rohrb.) N.E.Br.

Total named species:	**43**
Total genera:	**35**
Total families:	**19**
Total red data species:	**4**

COMMUNITY T10D: SANDSTONE WETLAND

Division: Pteridophyta

DENNSTAEDTIACEAE
Pteridium
aquilinum (L.) Kuhn subsp. aquilinum

Division: Anthophyta
Class: Dicotyledones

ANACARDIACEAE
Rhus
crenata Thunb.
APIACEAE
Berula
erecta (Huds.) Coville subsp. thunbergii (DC.) B.L.Burtt
ARALIACEAE
Centella
hermanniifolia (Eckl. & Zeyh.) Domin
Hydrocotyle
verticillata Thunb.
ASTERACEAE
Arctotheca
calendula (L.) Levyns
Cineraria
cf. erodioides DC.
Helichrysum
gymnocomum DC.
Senecio
cf. inaequidens DC.
oederiifolius DC.
purpureus L.
rigidus L.
CELASTRACEAE
Lauridia
tetragona (L.f.) R.H.Archer
ERICACEAE
Erica
gracilis J.C.Wendl.
FABACEAE
Psoralea
cf. affinis Eckl. & Zeyh.
GERANIACEAE
Pelargonium
grossularioides (L.) L'Hér.
LAMIACEAE
Mentha
aquatica L.
POLYGALACEAE
Polygala
virgata Thunb.
POLYGONACEAE
Rumex
lanceolatus Thunb.
RANUNCULACEAE
Ranunculus
multifidus Forssk.
SCROPHULARIACEAE
Selago
rotundifolia L.f. VU
THYMELAEACEAE
Passerina
corymbosa Eckl. ex C.H.Wright

Division: Anthophyta
Class: Monocotyledones

ARACEAE
Zantedeschia
aethiopica (L.) Spreng.
ASPHODELACEAE
Kniphofia
cf. rooperi (T.Moore) Lem. LC
CYPERACEAE
Carex
cf. aethiopica Schkuhr
Cyperus
sphaerospermus Schrad.
thunbergii Vahl
Eleocharis
limosa (Schrad.) Schult.
Ficinia
capitella (Thunb.) Nees
dunensis Levyns
Isolepis
cernua (Vahl) Roem. & Schult.
IRIDACEAE
Aristea
ecklonii Baker
JUNCACEAE
Juncus
cf. lomatophyllus Spreng.
POACEAE
Cynodon
dactylon (L.) Pers.
Stenotaphrum
secundatum (Walter) Kuntze

Total named species:	**35**
Total genera:	**30**
Total families:	**21**
Total red data species:	**1**

COMMUNITY T10E: DUNE WETLAND

Division: Anthophyta
Class: Dicotyledones

APIACEAE
Berula
erecta (Huds.) Coville subsp. thunbergii (DC.) B.L.Burtt
ARALIACEAE
Centella
asiatica (L.) Urban
ASTERACEAE
Felicia
amoena (Sch.Bip.) Levyns subsp. latifolia Grau
Helichrysum
asperum (Thunb.) Hilliard & B.L.Burtt
cymosum (L.) D.Don.
litorale Bolus
Metalasia
muricata (L.) D.Don.
Senecio
elegans L.
leptophyllus DC.
oederiifolius DC.
Seriphium
plumosum L.
Vellereophyton
vellereum (R.A.Dyer) Hilliard
BRASSICACEAE
Heliophila
subulata Burch. ex DC.
CAMPANULACEAE
Lobelia
cf. anceps L.f.
CARYOPHYLLACEAE
Silene
primuliflora Eckl. & Zeyh.
FABACEAE
Lotononis
laxa Eckl. & Zeyh.
Psoralea
repens L. NT
GENTIANACEAE
Chironia
baccifera L.
decumbens Levyns
tetragona L.f.
GERANIACEAE
Pelargonium
grossularioides (L.) L'Hér.
MYRICACEAE
Morella
cordifolia (L.) Killick
SCROPHULARIACEAE
Veronica
anagallis-aquatica L.
Zaluzianskya
maritima (L.f.) Walp.
THYMELAEACEAE
Passerina
rigida Wikstr.

Division: Anthophyta
Class: Monocotyledones

CYPERACEAE
Cyperus
natalensis Hochst.
Ficinia
nodosa (Rottb.) Goetgh.
Fuirena
hirsuta (P.J.Bergius) P.L.Forbes
Isolepis
cf. rubicunda Kunth
Scirpoides
thunbergii (Schrad.) Soják
JUNCACEAE
Juncus
capensis Thunb.
kraussii Hochst. subsp. kraussii LC
ORCHIDACEAE
Acrolophia
cochlearis (Lindl.) Schltr. & Bolus
Eulophia
speciosa (R.Br. ex Lindl.) Bolus De
Satyrium
hallackii Bolus subsp. hallackii EN
POACEAE
Ehrharta
villosa Schult.f.
Merxmuellera
cincta (Nees) Conert subsp. sericea N.P.Barker VU
Phragmites
australis (Cav.) Trin. ex Steud.
Polypogon
strictus Nees
Sporobolus
virginicus (L.) Kunth
RESTIONACEAE
Elegia
microcarpa (Kunth) Pillans
TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species:	**42**
Total genera:	**35**
Total families:	**18**
Total red data species:	**4**

COMMUNITY T10F: SLANGRIVIER (RIVER)

Division: Pteridophyta

ASPLENIACEAE
Asplenium
cordatum (Thunb.) Sw.
DRYOPTERIDACEAE
Cyrtomium
cf. micropterum (Kunze) Ching
PTERIDACEAE
Cheilanthes
viridis (Forssk.) Sw.
RUBIACEAE
Galopina
cf. circaeoides Thunb.

Division: Anthophyta
Class: Dicotyledones

AMARANTHACEAE
Pupalia
lappacea (L.) A.Juss.
ANACARDIACEAE
Rhus
lucida L. forma lucida
APOCYNACEAE
Carissa
bispinosa (L.) Desf. ex Brenan
Cynanchum
natalitium Schltr.
ARALIACEAE
Hydrocotyle
verticillata Thunb.
ASTERACEAE
Chrysanthemoides
monilifera (L.) Norl.
Cineraria
erodioides DC.
Conyza
scabrida DC.
Helichrysum
cymosum (L.) D.Don.
cf. foetidum (L.) Moench var. foetidum
gymnocomum DC.
Senecio
cf. deltoideus Less.
lanceus Aiton
oederiifolius DC.
rigidus L.
CAMPANULACEAE
Grammatotheca
bergiana (Cham.) C.Presl
Lobelia
erinus L. LC
CELASTRACEAE
Gymnosporia
buxifolia (L.) Szyszyl.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
CUCURBITACEAE
Kedrostis
nana (Lam.) Cogn.
EBENACEAE
Diospyros
dichrophylla (Gand.) De Winter
EUPHORBIACEAE
Adenocline
acuta (Thunb.) Baill.
Clutia
cf. daphnoides Lam.
FABACEAE
Psoralea
affinis Eckl. & Zeyh.
Virgilia
cf. oroboides (P.J.Bergius) T.M.Salter
GERANIACEAE
Geranium
ornithopodon Eckl. & Zeyh.
LAMIACEAE
Leonotis
leonurus (L.) R.Br.
MALVACEAE
Grewia
occidentalis L.
Hermannia
velutina DC.
Hibiscus
diversifolius Jacq.
MYRSINACEAE
Rapanea
melanophloeos (L.) Mez De
OLEACEAE
Olea
capensis L. subsp. capensis
POLYGONACEAE
Persicaria
attenuata (R.Br.) Soják subsp. africana K.L.Wilson
Rumex
acetosella L. subsp. angiocarpus (Murb.) Murb.
pulcher L. subsp. divaricatus (L.) Murb.
RANUNCULACEAE
Clematis
brachiata Thunb.
RHAMNACEAE
Rhamnus
prinoides L'Her.
Scutia
myrtina (Burm.f.) Kurz
ROSACEAE
Cliffortia
odorata L.f.
Rubus
cf. rigidus Sm.
RUBIACEAE
Anthospermum
aethiopicum L.
SOLANACEAE
Solanum
africanum Mill. LC
STILBACEAE
Halleria
lucida L.
VITACEAE
Rhoicissus
tomentosa (Lam.) Wild & R.B.Drumm.

COMMUNITY T10F: SLANGRIVIER (RIVER) (contd.)

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
  Scadoxus
    puniceus (L.) Friis & Nordal
ASPARAGACEAE
  Asparagus
    asparagoides (L.) Druce
CYPERACEAE
  Carex
    cf. aethiopica Schkuhr
  Cyperus
    thunbergii Vahl
  Ficinia
    lateralis (Vahl) Kunth
  Fuirena
    coerulescens Steud.
  Isolepis
    prolifera R.Br.
IRIDACEAE
  Aristea
    ecklonii Baker
  Chasmanthe
    aethiopica (L.) N.E.Br.
JUNCACEAE
  Juncus
    cf. capensis Thunb.
    kraussii Hochst. subsp. kraussii LC
    lomatophyllus Spreng.
POACEAE
  Phragmites
    australis (Cav.) Trin. ex Steud.
  Stenotaphrum
    secundatum (Walter) Kuntze
POTAMOGETONACEAE
  Potamogeton
    pusillus L.
TYPHACEAE
  Typha
    capensis (Rohrb.) N.E.Br.

Total named species:	**64**
Total genera:	**56**
Total families:	**35**
Total red data species:	**1**

T10G: SLANGRIVIER (WETLAND)

Division: Anthophyta

Class: Dicotyledones

ANACARDIACEAE
- Rhus
  - laevigata L.f.

ARALIACEAE
- Hydrocotyle
  - verticillata Thunb.

ASTERACEAE
- Conyza
  - scabrida DC.
- Felicia
  - echinata (Thunb.) Less.
- Helichrysum
  - cymosum (L.) D.Don.
  - gymnocomum DC.
  - helianthemifolium (L.) D.Don.
- Hippia
  - frutescens (L.) L.
- Nidorella
  - auriculata DC.
- Senecio
  - lanceus Aiton
  - cf. rigidus L.

EUPHORBIACEAE
- Clutia
  - alaternoides L.

FABACEAE
- Otholobium
  - stachyerum (Eckl. & Zeyh.) C.H.Stirt.
- Psoralea
  - pinnata L.

GUNNERACEAE
- Gunnera
  - perpensa L. De

LAMIACEAE
- Leonotis
  - leonurus (L.) R.Br.
- Mentha
  - cf. aquatica L.

MYRICACEAE
- Morella
  - quercifolia (L.) Killick
  - serrata (Lam.) Killick

POLYGONACEAE
- Persicaria
  - attenuata (R.Br.) Soják subsp. africana K.L.Wilson
- Rumex
  - lanceolatus Thunb.

ROSACEAE
- Cliffortia
  - odorata L.f.

RUBIACEAE
- Anthospermum
  - herbaceum L.f.

SCROPHULARIACEAE
- Veronica
  - anagallis-aquatica L.

Division: Anthophyta

Class: Monocotyledones

ARACEAE
- Zantedeschia
  - aethiopica (L.) Spreng.

CYPERACEAE
- Carex
  - aethiopica Schkuhr
- Cyperus
  - thunbergii Vahl
- Eleocharis
  - limosa (Schrad.) Schult.

IRIDACEAE
- Aristea
  - ecklonii Baker
- Watsonia
  - angusta Ker Gawl.

POACEAE
- Phragmites
  - australis (Cav.) Trin. ex Steud.
- Stenotaphrum
  - secundatum (Walter) Kuntze

TYPHACEAE
- Typha
  - capensis (Rohrb.) N.E.Br.

Total named species:	**33**
Total genera:	**29**
Total families:	**17**
Total red data species:	**1**

APPENDIX 4.3.2. PLANT SPECIES RECORDED FROM THYSPUNT – COMPOSITE LIST

NT: Near Threatened; R: Rare, VU: vulnerable EN: Endangered, CR: Critically Endangered

LC: Least Concern; DD: Data Deficient; De: Declining

Report produced by the SaSFLORA database: data (C) Coastec; database design and structures (C) Reuben Roberts 1998-2008

Division: Pteridophyta

ASPLENIACEAE
Asplenium
cordatum (Thunb.) Sw.
rutifolium (P. J. Bergius) Kunze
DENNSTAEDTIACEAE
Pteridium
aquilinum (L.) Kuhn subsp. aquilinum
PTERIDACEAE
Cheilanthes
viridis (Forssk.) Sw.
SCHIZAEACEAE
Schizaea
pectinata (L.) Sw.
THELYPTERIDACEAE
Thelypteris
confluens (Thunb.) C.V.Morton

Division: Anthophyta
Class: Dicotyledones

ACANTHACEAE
Barleria
obtusa Nees
Hypoestes
aristata (Vahl.) Sol. ex Roem. & Schult.
ACHARIACEAE
Ceratiosicyos
laevis (Thunb.) A.Meeuse
AIZOACEAE
Aizoon
rigidum L.f.
Tetragonia
decumbens Mill.
fruticosa L.
AMARANTHACEAE
Pupalia
lappacea (L.) A.Juss.
ANACARDIACEAE
Rhus
crenata Thunb.
glauca Thunb.
laevigata L.f.
lucida L. forma lucida
lucida L. forma scoparia (Eckl. & Zeyh.) Moffett
undulata Jacq.
APIACEAE
Alepidea
delicatula Weim. Ra
Berula
erecta (Huds.) Coville subsp. thunbergii (DC.) B.L.Burtt
Dasispermum
suffruticosum (P.J.Bergius) B.L.Burtt
Peucedanum
capense (Thunb.) Sond.
Sonderina
caruifolia (Sond.) H.Wolff DD
APOCYNACEAE
Astephanus
marginatus Decne.
Carissa
bispinosa (L.) Desf. ex Brenan
Cynanchum
natalitium Schltr.
obtusifolium L.f.
Gomphocarpus
fruticosus (L.) Aiton
Microloma
tenuifolium (L.) K.Schum.
Secamone
alpini Schult.
ARALIACEAE
Centella
asiatica (L.) Urban
hermanniifolia (Eckl. & Zeyh.) Domin
tridentata (L.f.) Drude ex Domin subsp. hermannifolia (Eckl. & Zeyh.) M.T.R.Schubert & B.-E,van Wyk
Cussonia
thyrsiflora Thunb.
Hydrocotyle
verticillata Thunb.
ASTERACEAE
Arctotheca
calendula (L.) Levyns
populifolia (P.J.Bergius) Norl.
Arctotis
elongata Thunb.
Aster
bakerianus Burtt Davy ex C.A.Sm.
Chrysanthemoides
monilifera (L.) Norl.
Cineraria
erodioides DC.
Conyza
scabrida DC.
Cotula
mariae Bremer & Humphries
sericea DC.
Cullumia
decurrens Less.
Dicerothamnus
rhinocerotis (DC.) Koekemoer
Disparago
ericoides (P.J.Bergius) Gaertn.
Euryops
munitus (L.f.) B.Nord.
Felicia
aethiopica (Burm.f.) Adamson & T.M.Salter
amelloides (L.) Voss
amoena (Sch.Bip.) Levyns subsp. latifolia Grau
echinata (Thunb.) Less.
Gazania
krebsiana Less.
linearis (Thunb.) Druce var. linearis
rigens (L.) Gaertn.
Helichrysum
anomalum Less.
asperum (Thunb.) Hilliard & B.L.Burtt
crispum (L.) D.Don.
cymosum (L.) D.Don.
felinum Less.
foetidum (L.) Moench var. foetidum
gymnocomum DC.
helianthemifolium (L.) D.Don.
litorale Bolus
patulum (L.) D.Don.
petiolare Hilliard & B.L.Burtt
praecinctum Klatt
rutilans (L.) D.Don LC
teretifolium (L.) D.Don.
Hippia
frutescens (L.) L.
Metalasia
densa (Lam.) Karis
muricata (L.) D.Don.

Nidorella
auriculata DC.
Othonna
cylindrica (Lam.) DC.
rufibarbis Harv. Th
Plecostachys
serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt
Pteronia
teretifolia (Thunb.) Fourc.
Senecio
deltoideus Less.
elegans L.
halimifolius L.
inaequidens DC.
lanceus Aiton
leptophyllus DC.
litorosus Fourc.
oederiifolius DC.
pellucidus DC.
purpureus L.
rigidus L.
rosmarinifolius L.f.
Seriphium
cinereum L.
plumosum L.
Syncarpha
argentea (Thunb.) B.Nord.
sordescens (DC.) B.Nord. VU
Tarchonanthus
camphoratus L.
Ursinia
anthemoides (L.) Poir.
Vellereophyton
vellereum (R.A.Dyer) Hilliard
BORAGINACEAE
Anchusa
capensis Thunb.
Myosotis
graminifolia DC.
BRASSICACEAE
Capparis
sepiaria L.
Heliophila
linearis (Thunb.) DC.
subulata Burch. ex DC.
Lepidium
africanum (Burm.f.) DC.
CAMPANULACEAE
Grammatotheca
bergiana (Cham.) C.Presl
Lobelia
anceps L.f.
erinus L. LC
Monopsis
unidentata (Dryand. ex Aiton) E.Wimm.
CARYOPHYLLACEAE
Cerastium
capense Sond.
Silene
bellidioides Sond.
primuliflora Eckl. & Zeyh.
CELASTRACEAE
Cassine
peragua L.
Gymnosporia
buxifolia (L.) Szyszyl.
Lauridia
tetragona (L.f.) R.H.Archer
Maytenus
procumbens (L.f.) Loes.
Mystroxylon
aethiopicum (Thunb.) Loes.
Pterocelastrus
tricuspidatus (Lam.) Sond. LC
Putterlickia
pyracantha (L.) Szyszyl.
Robsonodendron
maritimum (Bolus) R.H.Archer
CONVOLVULACEAE
Dichondra
micrantha Urban
Falkia
repens L.f.
CRASSULACEAE
Cotyledon
orbiculata L.
Crassula
expansa Dryand. subsp. expansa
nudicaulis L.
pubescens Thunb. subsp. pubescens
subulata L. var. fastigiata
tetragona L.
CUCURBITACEAE
Kedrostis
nana (Lam.) Cogn.
Zehneria
scabra (L.f.) Sond. subsp. scabra
DIPSACACEAE
Scabiosa
columbaria L. LC
DRYOPTERIDACEAE
Cyrtomium
micropterum (Kunze) Ching
EBENACEAE
Diospyros
dichrophylla (Gand.) De Winter
simii (Kuntze) De Winter
Euclea
natalensis A.DC.
racemosa Murray
ERICACEAE
Erica
chloroloma Lindl.
discolor Andrews
glumiflora Klotzsch ex Benth VU
gracilis J.C.Wendl.
pectinifolia Salisb.
sessiliflora L.f.
sparmannii L.f.
EUPHORBIACEAE
Adenocline
acuta (Thunb.) Baill.
Clutia
affinis Sond.
alaternoides L.
daphnoides Lam.
Euphorbia
epicyparissias E.Mey. ex Boiss.
Leidesia
procumbens (L.) Prain
FABACEAE
Dipogon
lignosus (L.) Verdc.
Indigofera
heterophylla Thunb.
mollis Eckl. & Zeyh.
stricta L.f.
sulcata DC.
tomentosa Eckl. & Zeyh.
zeyheri Spreng. ex Eckl. & Zeyh.
Lessertia
stenoloba E. Mey.
Lotononis
laxa Eckl. & Zeyh.

Otholobium
stachyerum (Eckl. & Zeyh.) C.H.Stirt.
virgatum (Burm.f.) C.H.Stirt.
Psoralea
affinis Eckl. & Zeyh.
pinnata L.
repens L. NT
sp. nov. ABL 15269
Rhynchosia
capensis (Burm.f.) Schinz
caribaea (Jacq.) DC.
chrysoscias Benth. ex Harv.
ciliata (Thunb.) Schinz
Tephrosia
capensis (Jacq.) Pers.
Virgilia
oroboides (P.J.Bergius) T.M.Salter
FLACOURTIACEAE
Dovyalis
rhamnoides (Burch. ex DC.) Burch. & Harv.
rotundifolia (Thunb.) Thunb. & Harv.
Scolopia
zeyheri (Nees) Harv.
Trimeria
trinervis Harv.
GENTIANACEAE
Chironia
baccifera L.
decumbens Levyns
peduncularis Lindl.
serpyllifolia Lehm.
tetragona L.f.
Sebaea
minutiflora Schinz
GERANIACEAE
Geranium
ornithopodon Eckl. & Zeyh.
Pelargonium
capitatum (L.) L'Hér.
grossularioides (L.) L'Hér.
suburbanum Clifford ex C.Boucher subsp.
suburbanum VU
GOODENIACEAE
Scaevola
plumieri (L.) Vahl
GUNNERACEAE
Gunnera
perpensa L. De
ICACINACEAE
Apodytes
dimidiata E.Mey. ex Arn. subsp. dimidiata
LAMIACEAE
Leonotis
leonurus (L.) R.Br.
Mentha
aquatica L.
Salvia
africana-lutea L.
LAURACEAE
Cassytha
ciliolata Nees
LENTIBULARIACEAE
Utricularia
bisquamata Schrank
LINACEAE
Linum
africanum L.
MALVACEAE
Grewia
occidentalis L.
Hermannia
saccifera (Turcz.) K.Schum.
velutina DC.
Hibiscus
aethiopicus L.
diversifolius Jacq.
MENISPERMACEAE
Cissampelos
capensis L.f.
MESEMBRYANTHEMACEAE
Carpobrotus
acinaciformis (L.) L.Bolus LC
deliciosus (L.Bolus) L.Bolus LC
Delosperma
patersoniae (L.Bolus) L.Bolus
Drosanthemum
hispidum (L.) Schwantes
Mesembryanthemum
canaliculatum Haw.
splendens L. subsp. splendens
MOLLUGINACEAE
Pharnaceum
dichotomum L.f.
MYRICACEAE
Morella
cordifolia (L.) Killick
quercifolia (L.) Killick
serrata (Lam.) Killick
MYRSINACEAE
Rapanea
gilliana (Sond.) Mez EN
melanophloeos (L.) Mez De
OLEACEAE
Chionanthus
foveolatus (E.Mey.) Stearn subsp. foveolatus
Olea
capensis L. subsp. capensis
exasperata Jacq.
ONAGRACEAE
Epilobium
capense Buchinger ex Hochst.
OROBANCHACEAE
Alectra
sessiliflora (Vahl) Kuntze
Harveya
purpurea (L.f.) Harv. ex Hook.
Melasma
scabrum P.J. Bergius
OXALIDACEAE
Oxalis
incarnata L.
polyphylla Jacq.
purpurea L.
PLANTAGINACEAE
Plantago
crassifolia Forssk.
PLUMBAGINACEAE
Limonium
scabrum (Thunb.) Kuntze
sp. nov. ABL 15508
POLYGALACEAE
Muraltia
squarrosa (L.f.) DC.
Polygala
ericaefolia DC.
microlopha DC.
myrtifolia L.
virgata Thunb.
POLYGONACEAE
Persicaria
attenuata (R.Br.) Soják subsp. africana K.L.Wilson

Rumex
acetosella L. subsp. angiocarpus (Murb.) Murb.
lanceolatus Thunb.
pulcher L. subsp. divaricatus (L.) Murb.
PROTEACEAE
Leucadendron
salignum P.J.Bergius LC
Protea
neriifolia R.Br. LC
RANUNCULACEAE
Clematis
brachiata Thunb.
Knowltonia
capensis (L.) Huth
Ranunculus
multifidus Forssk.
RHAMNACEAE
Phylica
gnidioides Eckl. & Zeyh.
litoralis (Eckl. & Zeyh.) D.Dietr.
Rhamnus
prinoides L'Her.
Scutia
myrtina (Burm.f.) Kurz
ROSACEAE
Cliffortia
filifolia L.f.
odorata L.f.
paucistaminea Weim.
Rubus
rigidus Sm.
RUBIACEAE
Anthospermum
aethiopicum L.
herbaceum L.f.
prostratum Sond.
spathulatum Spreng.
Canthium
spinosum (Klotzsch) Kuntze
Galopina
circaeoides Thunb.
Psydrax
obovata Eckl. & Zeyh. subsp. obovata
RUTACEAE
Agathosma
apiculata G.Mey.
sp. nov. ABL 15400
stenopetala (Steud.) Steud. VU
Clausena
anisata (Willd.) Hook.f. ex Benth.
Zanthoxylum
capense (Thunb.) Harv. LC
SALVADORACEAE
Azima
tetracantha Lam.
SANTALACEAE
Osyris
compressa (P.J.Bergius) A.DC.
Rhoiacarpos
capensis (Harv.) A.DC.
Thesidium
fragile (Thunb.) Sond.
Thesium
commutatum Sond.
SAPINDACEAE
Allophylus
decipiens (Sond.) Radlk.
SAPOTACEAE
Sideroxylon
inerme L. subsp. inerme

SCROPHULARIACEAE
Chaenostoma
campanulatum (Benth.) Kuntze LC
hispidum (Thunb.) Druce
Dischisma
ciliatum (P.J.Bergius) Choisy
Hebenstretia
cordata L.
integrifolia L.
Jamesbrittenia
microphylla (L.f.) Hilliard
Manulea
obovata Benth.
Selago
canescens L.f.
rotundifolia L.f. VU
Veronica
anagallis-aquatica L.
Zaluzianskya
maritima (L.f.) Walp.
SOLANACEAE
Solanum
africanum Mill. LC
linnaeanum Hepper & E.Jaeger
STILBACEAE
Halleria
lucida L.
THYMELAEACEAE
Gnidia
stypheloides Meisn.
Passerina
corymbosa Eckl. ex C.H.Wright
rigida Wikstr.
Struthiola
argentea Lehm.
URTICACEAE
Droguetia
iners (Forssk.) Schweinf.
VISCACEAE
Viscum
obscurum Thunb.
VITACEAE
Cyphostemma
cirrhosum (Thunb.) Desc. ex Wild & R.B.Drumm.
Rhoicissus
digitata (L.f.) Gilg & M.Brandt
tomentosa (Lam.) Wild & R.B.Drumm.
tridentata (L.f.) Wild & R.B.Drumm. LC
ZYGOPHYLLACEAE
Roepera
maritima Sond.

Division: Anthophyta
Class: Monocotyledones

AMARYLLIDACEAE
Boophone
disticha (L.f.) Herb. De
Brunsvigia
gregaria R.A.Dyer
Cyrtanthus
loddigesianus (Herb.) R.A.Dyer LC
Scadoxus
puniceus (L.) Friis & Nordal
ARACEAE
Zantedeschia
aethiopica (L.) Spreng.

ASPARAGACEAE
Asparagus
aethiopicus L.
africanus Lam.
asparagoides (L.) Druce
racemosus Willd.
virgatus Baker
ASPHODELACEAE
Gasteria
acinacifolia (Jacq.) Haw.
Kniphofia
rooperi (T.Moore) Lem. LC
Trachyandra
ciliata (L.f.) Kunth LC
BEHNIACEAE
Behnia
reticulata (Thunb.) Didr.
COLCHICACEAE
Colchicum
eucomoides (Jacq.) J.C.Manning & Vinnersten
CYPERACEAE
Bolboschoenus
maritimus (L.) Palla
Carex
aethiopica Schkuhr
Cladium
mariscus (L.) Pohl subsp. jamaicense (Crantz) Kuekenth.
Cyperus
longus L.
natalensis Hochst.
sphaerospermus Schrad.
thunbergii Vahl
Eleocharis
limosa (Schrad.) Schult.
Ficinia
bulbosa (L.) Nees
capitella (Thunb.) Nees
dunensis Levyns
indica (Lam.) Pfeiffer
lateralis (Vahl) Kunth
nodosa (Rottb.) Goetgh.
ramosissima Kunth
Fuirena
coerulescens Steud.
hirsuta (P.J.Bergius) P.L.Forbes
Isolepis
cernua (Vahl) Roem. & Schult.
marginata (Thunb.) A.Dietr.
prolifera R.Br.
rubicunda Kunth
Neesenbeckia
punctoria (Vahl) Levyns
Scirpoides
thunbergii (Schrad.) Soják
Tetraria
brachyphylla Levyns NT
bromoides (Lam.) Pfeiffer
cuspidata (Rottb.) C.B.Clarke
DIOSCOREACEAE
Dioscorea
sylvatica (Kunth) Eckl. VU
HAEMODORACEAE
Wachendorfia
paniculata Burm.
HEMEROCALLIDACEAE
Caesia
contorta (L.f.) T.Durand & Schinz
HYACINTHACEAE
Albuca
cooperi Baker
Drimia
hesperantha J.C.Manning & Goldblatt
Ornithogalum
graminifolium Thunb.
IRIDACEAE
Aristea
ecklonii Baker
Chasmanthe
aethiopica (L.) N.E.Br.
Gladiolus
floribundus Jacq.
wilsonii (Baker) Goldblatt & J.C.Manning
Melasphaerula
ramosa (L.) N.E.Br.
Moraea
elliotii Baker
setifolia (L.f.) Druce
Romulea
rosea (L.) Eckl.
Tritoniopsis
caffra (Ker Gawl. ex Baker) Goldblatt
Watsonia
angusta Ker Gawl.
JUNCACEAE
Juncus
capensis Thunb.
kraussii Hochst. subsp. kraussii LC
lomatophyllus Spreng.
JUNCAGINACEAE
Triglochin
striata Ruiz & Pav.
LANARIACEAE
Lanaria
lanata (L.) T.Durand & Schinz
ORCHIDACEAE
Acrolophia
cochlearis (Lindl.) Schltr. & Bolus
Bonatea
speciosa (L.f.) Willd. var. speciosa LC
Disa
chrysostachya Sw.
Eulophia
speciosa (R.Br. ex Lindl.) Bolus De
Holothrix
villosa Lindl.
Satyrium
hallackii Bolus subsp. hallackii EN
membranaceum Sw.
parviflorum Sw.
princeps Bolus VU
POACEAE
Cynodon
dactylon (L.) Pers.
Ehrharta
calycina Sm.
erecta Lam.
villosa Schult.f. var. maxima
villosa Schult.f. var. villosa
Imperata
cylindrica (L.) Raeuschel
Melica
decumbens Thunb.
Merxmuellera
cincta (Nees) Conert subsp. sericea N.P.Barker VU
Panicum
maximum Jacq.
Pentaschistis
pallida (Thunb.) H.P.Linder LC
Phragmites
australis (Cav.) Trin. ex Steud.
Polypogon
strictus Nees

Setaria
sphacelata (Schum.) Stapf & C.E.Hubb. ex Moss var.
sphacelata
Sporobolus
virginicus (L.) Kunth
Stenotaphrum
secundatum (Walter) Kuntze
Themeda
triandra Forssk.
Tribolium
hispidum (Thunb.) Desv.
POTAMOGETONACEAE
Potamogeton
pusillus L.
RESTIONACEAE
Elegia
microcarpa (Kunth) Pillans
Hypodiscus
striatus (Kunth) Mast.
Ischyrolepis
eleocharis (Nees ex Mast.) H.P.Linder
leptoclados (Mast.) H.P.Linder
Restio
triticeus Rottb.
Thamnochortus
fruticosus P.J.Bergius
TYPHACEAE
Typha
capensis (Rohrb.) N.E.Br.

Total named species:	**398**
Total genera:	**249**
Total families:	**92**
Total red data species:	**19**
Total introduced species:	**6**

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
Ferns										
ASPLENIACEAE	Asplenium cordatum (Thunb.) Sw.		Bokkeveld Mts to E Africa and Madagascar	South east extension of distribution, rock crevices and boulder bases						1
ASPLENIACEAE	Asplenium rutifolium (P. J. Bergius) Kunze	carrot fern	Swellendam to tropical Africa	South east extension of distribution, low-level epiphyte or lithophyte in forests						1
DENNSTAEDTIACEAE	Pteridium aquilinum (L.) Kuhn subsp. aquilinum		Gifberg to Europe	No change, fynbos and forest margins						
PTERIDACEAE	Cheilanthes viridis (Forssk.) Sw.		Cape Peninsula to Arabia and India	No change, forest margins and scrub						
SCHIZAEACEAE	Schizaea pectinata (L.) Sw.	curly grass fern, toothbrush fern	Clanwilliam to E Africa and Madagascar	No change, dry mountain slopes						
THELYPTERIDACEAE	Thelypteris confluens (Thunb.) C.V.Morton	bog fern, scaly lady fern	Cape Peninsula to W and E Africa, Madagascar and	No change, marshes and stream banks						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
			Australasia							
Dicotyledons										
ACANTHACEAE	Barleria obtusa Nees		Humansdorp to Zimbabwe	No change, bush and forest margins						
ACANTHACEAE	Hypoestes aristata (Vahl.) Sol. ex Roem. & Schult.	seeroogblommetjie	De Hoop to tropical Africa	No change, coastal forest margins						
ACHARIACEAE	Ceratiosicyos laevis (Thunb.) A.Meeuse		Knysna to N Province	No change, forest margins						
AIZOACEAE	Aizoon rigidum L.f.		Gansbaai and Little Karoo to East London	No change, dry stony slopes, often near the sea						
AIZOACEAE	Tetragonia decumbens Mill.	kinkelbossie	S Namibia to E Cape	No change, coastal dunes						
AIZOACEAE	Tetragonia fruticosa L.	kinkelbossie, kinkelklappers, kleinsaadklaapies	Namaqualand to Clanwilliam to Port	No change, granite and sandstone slopes, especially						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
		brak, klimopkinkelbossie, porslein, slaaibos	Elizabeth	along the coast						
AMARANTHACEAE	Pupalia lappacea (L.) A.Juss.	bosklits, sweethearts	George to tropical Africa and Asia	No change, forest and bush						
ANACARDIACEAE	Rhus crenata Thunb.	(dune) crow-berry, duinekraaibessie, rosyntjiebos	Cape Peninsula to S KwaZulu-Natal	No change , sandy coastal flats						
ANACARDIACEAE	Rhus glauca Thunb.	bloukoeniebos, blue kuni-bush, taaiblaar	Velddrif to Kentani	No change, mostly on dunes						
ANACARDIACEAE	Rhus laevigata L.f.	duinetaaibos, dune taaibos, koerentebos, ranktaaibos, taaibos,	Lamberts Bay to East London	No change, coastal flats and slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
		umhlakothi								
ANACARDIACEAE	Rhus lucida L. forma lucida	blinktaaibos	Citrusdal to Zimbabwe	No change, sandy flats and slopes						
ANACARDIACEAE	Rhus lucida L. forma scoparia (Eckl. & Zeyh.) Moffett		Citrusdal to Zimbabwe	No change, sandy flats and slopes						
ANACARDIACEAE	Rhus undulata Jacq.	karee, koeniebos, kuni-bush	S Namibia to Ladismith	Major south eastern extension to distribution, stony slopes						1
APIACEAE	Alepidea delicatula Weim.		Swartberg and Outeniqua Mts	Eastern extension of distribution, high, rocky sandstone slopes**, Cape endemic**		1				1
APIACEAE	Berula erecta (Huds.) Coville subsp. thunbergii (DC.) B.L.Burtt	tandpynbossie, tandpynwortel, toothache root, water parsnip	Cape Peninsula to Humansdorp, nearly cosmopolitan	No change, streamsides						
APIACEAE	Dasispermum suffruticosum	duineseldery	S Namaqualand to	No change, coastal dunes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
	(P.J.Bergius) B.L.Burtt		KwaZulu-Natal							
APIACEAE	Peucedanum capense (Thunb.) Sond.	lidbossie	Karoo, Swartberg and Outeniqua Mts to Mpumalanga	No change, rocky or sandy slopes						
APIACEAE	Sonderina caruifolia (Sond.) H.Wolff		Lambert's Bay to Cape Peninsula	Major eastern extension of distribution, **Cape flats endemic**					1	1
APOCYNACEAE	Astephanus marginatus Decne.		Knysna to East London	No change, coastal bush						
APOCYNACEAE	Carissa bispinosa (L.) Desf. ex Brenan	isibetha-nkunzi, noemnoem, num-num	Elim to tropical Africa	No change, coastal and karroid scrub						
APOCYNACEAE	Cynanchum natalitium Schltr.	klimop	Knysna to KwaZulu-Natal	No change, coastal bush						
APOCYNACEAE	Cynanchum obtusifolium L.f.	melktou, monkey rope	Cape Peninsula to Mozambique	No change, coastal bush						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
APOCYNACEAE	Gomphocarpus fruticosus (L.) Aiton	shrubby milkweed, tontelbossie	Cape Peninsula and Karoo to George, widespread and almost cosmopolitan	No change, disturbed areas						
APOCYNACEAE	Microloma tenuifolium (L.) K.Schum.	kannetjies, skilpadbos, wax vine	Gifberg to E Cape	No change, stony slopes and flats						
APOCYNACEAE	Secamone alpini Schult.	melktou, monkey rope	Clanwilliam to Uganda	No change, bush and forest to 1000m						
ARALIACEAE	Centella asiatica (L.) Urban	waternael	Cape Peninsula to tropical Africa, widely distributed in the tropics and S hemisphere	No change, marshy or damp places						
ARALIACEAE	Centella hermanniifolia (Eckl. & Zeyh.) Domin		Namaqualand to Port Elizabeth	No change, coastal flats and lower slopes						
ARALIACEAE	Centella tridentata (L.f.) Drude ex Domin subsp. hermannifolia (Eckl. &		Namaqualand to Port Elizabeth	No change, coastal flats and lower slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
	Zeyh.) M.T.R.Schubert & B.-E,van Wyk									
ARALIACEAE	Cussonia thyrsiflora Thunb.	kuskiepersol	Cape Peninsula to E Cape	No change, coastal scrub						
ARALIACEAE	Hydrocotyle verticillata Thunb.	pennywort	Cape Peninsula to Port Elizabeth, widespread in tropics and subtropics	No change, marshes, seeps, streamsides						
ASTERACEAE	Arctotheca calendula (L.) Levyns	Cape weed, gousblom	Namaqualand and Karoo to Cape Peninsula and Humansdorp	Slight eastern extension of distribution, coastal areas or disturbed soil						1
ASTERACEAE	Arctotheca populifolia (P.J.Bergius) Norl.	sea pumpkin, seepampoen	Saldanha to Mozambique	No change, coastal dunes						
ASTERACEAE	Arctotis elongata Thunb.		No information available	N/A						
ASTERACEAE	Aster bakerianus Burtt Davy ex C.A.Sm.		George to Tanzania	No change, rocky grassland						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
ASTERACEAE	Chrysanthemoides monilifera (L.) Norl.	bietou, boetabessie, bosluisbessie, brother berry	Namaqualand to tropical Africa	No change, sandstone and limestone slopes and flats						
ASTERACEAE	Cineraria erodioides DC.		Free State, Western Cape, Eastern Cape	No change						
ASTERACEAE	Conyza scabrida DC.	bakbesembossie, oondbos, ovenbush	Clanwilliam to Zimbabwe	Southern range extension, normally occurs on sandstone slopes or forest margins, often near streams						1
ASTERACEAE	Cotula mariae Bremer & Humphries		Agulhas to Port Elizabeth	No change, **coastal dune endemic**					1	
ASTERACEAE	Cotula sericea DC.		Mossel Bay to E Cape	No change, coastal slopes						
ASTERACEAE	Cullumia decurrens Less.		Swartberg Mts and Cloete's Pass to Port Elizabeth	No change, sandstone slopes near streams, **Cape endemic**					1	

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
ASTERACEAE	Dicerothamnus rhinocerotis (DC.) Koekemoer	renosterbos	S Namibia to E Cape and Karoo	No change, dry shale and sandstone slopes and flats						
ASTERACEAE	Disparago ericoides (P.J.Bergius) Gaertn.		Darling to Matroosberg and Gouritsmond	Eastern extension of distribution, sandstone slopes, **Cape endemic**						1
ASTERACEAE	Euryops munitus (L.f.) B.Nord.	umSola	Langkloof to Port Elizabeth	No change, clay and sandstone slopes on dry fynbos, **E Cape endemic**					1	
ASTERACEAE	Felicia aethiopica (Burm.f.) Adamson & T.M.Salter	wilde-aster, wilde-astertjie	Cedarberg Mts to KwaZulu-Natal	No change, rocky flats and slopes						
ASTERACEAE	Felicia amelloides (L.) Voss	wilde-aster	Stilbaai to E Cape	No change, coastal bush						
ASTERACEAE	Felicia amoena (Sch.Bip.) Levyns subsp. latifolia Grau		Cedarberg Mts to E Cape	No change, stony slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
Asteraceae	Felicia echinata (Thunb.) Less.	bloublommetjie	Mossel Bay to Port Alfred	No change, coastal bush						
ASTERACEAE	Gazania krebsiana Less.	botterblom, gousblom, rooigazania, rooigousblom	throughout southern Africa to Tanzania	No change, roadsides, flats and lower slopes						
ASTERACEAE	Gazania linearis (Thunb.) Druce var. linearis	bensli, botterblom	Humansdorp to KwaZulu-Natal	No change, grassy slopes						
ASTERACEAE	Gazania rigens (L.) Gaertn.		George to S Mozambique	No change, coastal dunes and sandy flats						
ASTERACEAE	Helichrysum anomalum Less.		Outeniqua and Kammanassie Mts to Lesotho	No change, stony slopes						
ASTERACEAE	Helichrysum asperum (Thunb.) Hilliard & B.L.Burtt	geilsiekte-opslag	Namibia to KwaZulu-Natal	No change, stony slopes and flats						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
ASTERACEAE	Helichrysum crispum (L.) D.Don.	Hottentotskooigoed, kooigoed	Bloubergstrand to George	No change, **coastal dunes endemic**					1	
ASTERACEAE	Helichrysum cymosum (L.) D.Don.		Mamre to Mpumalanga	No change, sandy slopes in damp places						
ASTERACEAE	Helichrysum felinum Less.		Cape Peninsula to KwaZulu-Natal	No change, sandstone slopes						
ASTERACEAE	Helichrysum foetidum (L.) Moench var. foetidum	brandblom, geelsewejaartjie	Cedarberg Mts to E Cape	No change, damp rocky slopes						
ASTERACEAE	Helichrysum gymnocomum DC.		KwaZulu Natal, Limpopo, Eastern Cape	No change						
ASTERACEAE	Helichrysum helianthemifolium (L.) D.Don.		Cedarberg Mts to Uitenhage	No change, rocky slopes in damp places, **Cape endemic**					1	
ASTERACEAE	Helichrysum litorale Bolus	everlasting	Saldanha to E Cape	No change, coastal sands						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
ASTERACEAE	Helichrysum patulum (L.) D.Don.	Hottentot's bedding, Hottentotskooigoed, kooigoed	Cape Peninsula to Mossel Bay	Major eastern extension of distribution, **coastal dunes endemic**					1	1
ASTERACEAE	Helichrysum petiolare Hilliard & B.L.Burtt	kooigoed	Cedarberg and Jonkershoek Mts to KwaZulu-Natal	No change, sheltered slopes and forest margins						
Asteraceae	Helichrysum praecinctum Klatt		Eastern Cape	No change						
ASTERACEAE	Helichrysum rutilans (L.) D.Don		Mamre and Worcester to Free State	No change, rocky slopes						
ASTERACEAE	Helichrysum teretifolium (L.) D.Don.		Piketberg to KwaZulu-Natal	No change, sandy slopes and dunes						
ASTERACEAE	Hippia frutescens (L.) L.	rankals	Ceres to Storms River	80km east of distribution, sandstone slopes, often near streams or marshes, **Cape endemic**						1

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
ASTERACEAE	Metalasia densa (Lam.) Karis	blombos	Namaqualand to N Province	No change, sandy or stony flats and slopes						
ASTERACEAE	Metalasia muricata (L.) D.Don.	blombos, steekbos, witsteekbossie	Yzerfontein to Transkei	No change, coastal sands						
ASTERACEAE	Nidorella auriculata DC.		Caledon to tropical Africa	No change, damp places, often marshes or forest margins						
ASTERACEAE	Othonna cylindrica (Lam.) DC.	dikblaarbobbejaankool, ossierapuis	Namaqualand to Humansdorp, W Karoo and E Cape	No change, sandy and stony flats and rocks						
ASTERACEAE	Othonna rufibarbis Harv.		Western Cape, Eastern Cape	No change						
ASTERACEAE	Plecostachys serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt	vaaltee	Langebaan to KwaZulu-Natal	No change, sandy coastal flats or damp slopes, often coastal						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
ASTERACEAE	Pteronia teretifolia (Thunb.) Fourc.		Potberg to E Cape	No change, Limestone outcrops or forest margins						
ASTERACEAE	Senecio deltoideus Less.		Swellendam to tropical Africa	No change, forest margins cliffs						
ASTERACEAE	Senecio elegans L.	strandblommetjie, veld cineraria, wild cineraria	Saldanha to Port Elizabeth	No change, **coastal dune endemic**					1	
ASTERACEAE	Senecio halimifolius L.	tabakbos	Lambert's Bay to Hermanus	Major eastern extension of distribution, **coastal dunes endemic**					1	1
ASTERACEAE	Senecio inaequidens DC.		Widespread	No change						
ASTERACEAE	Senecio lanceus Aiton	kammiebos, vleibos	Cedarberg Mts to Cape Peninsula and to KwaZulu-Natal	No change, sandstone slopes near streams						
ASTERACEAE	Senecio leptophyllus		Albertinia to Free State	No change, dry stony karroid						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
	DC.			slopes						
ASTERACEAE	Senecio litorosus Fourc.		Western Cape, Eastern Cape	No change						
ASTERACEAE	Senecio oederiifolius DC.	kouterbossie	Humansdorp to Van Staden's Mts	No change, damp grassland, **Cape endemic**		1				
ASTERACEAE	Senecio pellucidus DC.		Eastern Cape	No change						
ASTERACEAE	Senecio purpureus L.		Cape Peninsula to S KwaZulu-Natal	No change, moist slopes, especially after fire						
ASTERACEAE	Senecio rigidus L.	poisonous ragwort, rough ragwort	Olifants River Valley to Uitenhage	No change, sandstone slopes and gullies, **Cape endemic**					1	
ASTERACEAE	Senecio rosmarinifolius L.f.	gryshongerblom	Namaqualand to Cape Peninsula to E Cape and Karoo	No change, sandy and stony slopes						
ASTERACEAE	Seriphium cinereum L.	vaalhartebeeskaroo,	Cape Peninsula to	No change, slopes, often shale,					1	

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
		vaalrenosterbos	Riviersonderend Mts	**Cape endemic**						
ASTERACEAE	Seriphium plumosum L.	"khoi"-kooigoed, slangbos	Throughout southern Africa	No change, rocky flats and slopes						
ASTERACEAE	Syncarpha argentea (Thunb.) B.Nord.	silver everlasting	Uitenhage to E Cape	No change, coastal grassland and scrub						
ASTERACEAE	Syncarpha sordescens (DC.) B.Nord.		Port Elizabeth to Alexandria	No change, dunes and sandy slopes						
ASTERACEAE	Tarchonanthus camphoratus L.	camphor bush, isiduli, kanferbos	Namibia, Cape Peninsula to E Africa	No change, widespread, mainly coastal						
ASTERACEAE	Ursinia anthemoides (L.) Poir.	bergmargriet, ma(r)griet, marigold	S Namibia and Karoo to Port Elizabeth	No change, sandy and gravel slopes and flats						
Asteraceae	Vellereophyton vellereum (R.A.Dyer) Hilliard		Humansdorp to East London	No change, dune slacks						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
BORAGINACEAE	Anchusa capensis Thunb.	Cape forget-me-not, forget-me-not, ystergras	Namibia, Lesotho and drier parts of S Africa to Mpumalanga	No change, roadsides						
BORAGINACEAE	Myosotis graminifolia DC.		Port Elizabeth to Mpumalanga	No change, coastal bush						
BRASSICACEAE	Capparis sepiaria L.	Cape caper, intshilo, Kaapse-kappertjie, kapkappertjie	Riversdale through E Africa to Malaysia	No change, coastal scrub						
BRASSICACEAE	Heliophila linearis (Thunb.) DC.		Langebaan to E Cape	No change, sandy coastal flats						
BRASSICACEAE	Heliophila subulata Burch. ex DC.		Cold Bokkeveld to Cape Peninsula to E Cape	No change, coastal flats and slopes						
BRASSICACEAE	Lepidium africanum (Burm.f.) DC.	bird-seed, peperbossie, pepper weed	Widespread indigenous weed	No change, on disturbed ground						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
CAMPANULACEAE	Grammatotheca bergiana (Cham.) C.Presl	water lobelia	Bainskloof to KwaZulu-Natal	No change, marshy flats						
CAMPANULACEAE	Lobelia anceps L.f.	vleilobelia	Cape Peninsula to KwaZulu-Natal	No change, damp places, usually near the coast						
CAMPANULACEAE	Lobelia erinus L.	wild lobelia	Bokkeveld Mts to tropical Africa	No change, lower mountain slopes and coastal flats						
CAMPANULACEAE	Monopsis unidentata (Dryand. ex Aiton) E.Wimm.	wild violet	Riviersonderend to KwaZulu-Natal	No change, damp sandy flats and rocky slopes at low elevations						
CARYOPHYLLACEAE	Cerastium capense Sond.	horingblom	widespread in southern Africa	No change, sheltered flats and slopes and waste sites						
CARYOPHYLLACEAE	Silene bellidioides Sond.	wild tobacco, wildetabak	Tulbagh to Cape Peninsula and Port Elizabeth to Mpumalanga	No change, sandy flats and slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
CARYOPHYLLACEAE	Silene primuliflora Eckl. & Zeyh.		Mossel Bay to KwaZulu-Natal	No change, coastal sand dunes						
CELASTRACEAE	Cassine peragua L.	bastard saffronwood, bastersaffraan, Cape saffron, ikhukhuzi, lepelhout	Bokkeveld Mountains to Cape Peninsula to Mpumalanga	No change, coastal scrub, woodland or forest margins						
CELASTRACEAE	Gymnosporia buxifolia (L.) Szyszyl.	gewonependoring, mnquqoba, stinkpendoring	widespread in southern and tropical Africa	No change, forest margins and disturbed areas						
CELASTRACEAE	Lauridia tetragona (L.f.) R.H.Archer	climbing saffron, ranksaffraan	Hermanus to N Province	No change, scrub						
CELASTRACEAE	Maytenus procumbens (L.f.) Loes.	duinekokoboom, dune koko tree, umPhono-phono	De Hoop to tropical Africa	No change, coastal dune forest						
CELASTRACEAE	Mystroxylon aethiopicum (Thunb.)	Cape cherry, koeboebessie,	Heidelberg to tropical	No change, forest margins or						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
	Loes.	kubusbessie	Africa	scrub						
CELASTRACEAE	Pterocelastrus tricuspidatus (Lam.) Sond.	cherrywood, kershout, utwina	Velddrif to Cape Peninsula to Port Edward	No change, dune scrub or forest						
CELASTRACEAE	Putterlickia pyracantha (L.) Szyszyl.	basterpendoring, pendoring, wildegranaat	Velddrif to E Cape	No change, coastal scrub						
CELASTRACEAE	Robsonodendron maritimum (Bolus) R.H.Archer	duinesybas	Cape Peninsula to E Cape	No change, coastal scrub						
CONVOLVULACEAE	Dichondra micrantha Urban	daisy grass	Cape Peninsula to tropical Africa and worldwide	No change, rock sheets or grassy flats						
CONVOLVULACEAE	Falkia repens L.f.	oortjies	Darling to E Cape	No change, damp coastal flats and seeps						
CRASSULACEAE	Cotyledon orbiculata L.	honde-oor, kouterie, pig's	Namibia and South	No change, sandy or stony soils						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
		ear, plakkie(s), varkoor	Africa	in scrub						
CRASSULACEAE	Crassula expansa Dryand. subsp. expansa	strepiescrassula	S Namibia to Mozambique	No change, coastal sands and limestone						
CRASSULACEAE	Crassula nudicaulis L.	bergplakkie, skraalplakkie	Bokkeveld Mts to N Province	No change, dry stony slopes						
CRASSULACEAE	Crassula pubescens Thunb. subsp. pubescens		Bokkeveld Mts to E Cape and Karoo	No change, sheltered rock crevices						
CRASSULACEAE	Crassula subulata L. var. fastigiata		Bokkeveld Mts to Port Alfred	No change, dry rocky slopes						
CRASSULACEAE	Crassula tetragona L.	karkai	Namaqualand and Karoo to E Cape	No change, dry slopes						
CUCURBITACEAE	Kedrostis nana (Lam.) Cogn.	bryony, ystervarkpatat(s)	Saldanha to KwaZulu-Natal	No change, coastal scrub						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
CUCURBITACEAE	Zehneria scabra (L.f.) Sond. subsp. scabra	dawidjies	Cape Peninsula to tropical Africa	No change, forest margins						
DIPSACACEAE	Scabiosa columbaria L.	bitterbos, jongmansknoop, scabious	widespread through Africa, Europe and Asia	No change, rocky slopes						
DRYOPTERIDACEAE	Cyrtomium micropterum (Kunze) Ching		Mpumalanga, KwaZulu-Natal, Limpopo, Eastern Cape	No change						
EBENACEAE	Diospyros dichrophylla (Gand.) De Winter	poison peach, tolbos	Potberg and Montagu to N Province	No change, coastal scrub and forest margins						
EBENACEAE	Diospyros simii (Kuntze) De Winter		KwaZulu Natal	Southern extension of distribution						1
EBENACEAE	Euclea natalensis A.DC.	bergghwarrie, swartbasboom	Pakhuis Mts to Langebaan and Humansdorp to tropical Africa	No change, bush and scrub						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
EBENACEAE	Euclea racemosa Murray	bosghwarrie, bush guarri, kersbos, sea guarri, seeghwarrie	Namaqualand to E Cape	No change, coastal scrub						
ERICACEAE	Erica chloroloma Lindl.		Wilderness to Fish River mouth	No change, coastal dunes and limestone						
ERICACEAE	Erica discolor Andrews		Betty's Bay to Humansdorp and Swartberg	No change, coastal flats and lower mountain slopes, **Cape endemic**					1	
ERICACEAE	Erica glumiflora Klotzsch ex Benth		George to Humansdorp	No change, sand dunes and lower slopes, **S coast endemic**					1	
ERICACEAE	Erica gracilis J.C.Wendl.		Heidelberg to Humansdorp	No change, flats and lower slopes, **S coast endemic**					1	
ERICACEAE	Erica pectinifolia Salisb.		Uniondale to Port Elizabeth	No change, flats to middle slopes, **E coast endemic**					1	

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
ERICACEAE	Erica sessiliflora L.f.		Piketberg to Humansdorp	No change, flats and mostly lower slopes, **Cape endemic**					1	
ERICACEAE	Erica sparmannii L.f.		Uniondale to Humansdorp	No change, flats and lower slopes, **E coast endemic**					1	
EUPHORBIACEAE	Adenocline acuta (Thunb.) Baill.		Hottentots Holland Mts to Mpumalanga	No change, coastal bush						
EUPHORBIACEAE	Clutia affinis Sond.	oumeisieknie	Villiersdorp to Mpumalanga	No change, forest margins						
EUPHORBIACEAE	Clutia alaternoides L.		Namaqualand to E Cape	No change, rocky sandstone or limestone slopes						
EUPHORBIACEAE	Clutia daphnoides Lam.	vaalblaar, vaalbliksembos, vaalbossie	Saldanha to E Cape	No change, coastal bush						
Euphorbiaceae	Euphorbia epicyparissias E.Mey. ex Boiss.	pisgoed	Gansbaai to Mpumalanga	No change, coastal bush and forest margins						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
EUPHORBIACEAE	Leidesia procumbens (L.) Prain		Cape Peninsula to Mpumalanga	No change, forest and bush						
FABACEAE	Dipogon lignosus (L.) Verdc.	bosklimop	Saldanha to E Cape	No change, scrub or forest						
FABACEAE	Indigofera heterophylla Thunb.		Namaqualand and Karoo to E Cape	No change, renosterveld and fynbos						
FABACEAE	Indigofera mollis Eckl. & Zeyh.		Western Cape, Eastern Cape	No change						
FABACEAE	Indigofera stricta L.f.		Mossel Bay to E Cape	No change, coastal bush and thicket						
FABACEAE	Indigofera sulcata DC.		Swartberg Mts to E Cape	No change, mountain and lowland fynbos						
FABACEAE	Indigofera tomentosa Eckl. & Zeyh.		Mossel Bay to E Cape	No change, coastal fynbos						
FABACEAE	Indigofera zeyheri Spreng. ex Eckl. &		Widespread	No change						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
	Zeyh.									
FABACEAE	Lessertia stenoloba E. Mey.		Bredasdorp to E Cape	No change, coastal and arid fynbos						
FABACEAE	Lotononis laxa Eckl. & Zeyh.		Widespread	No change						
FABACEAE	Otholobium stachyerum (Eckl. & Zeyh.) C.H.Stirt.		Caledon to E Cape	No change, grassy fynbos, riverbanks, forest margins, 200-1450m						
FABACEAE	Otholobium virgatum (Burm.f.) C.H.Stirt.		Porterville and Saldanha to E Cape	No change, marshes in fynbos						
FABACEAE	Psoralea affinis Eckl. & Zeyh.		Tulbagh to E Cape	No change, mountain, lowland and coastal fynbos, marshy areas						
FABACEAE	Psoralea pinnata L.	bloubos, bloukeur, fonteinbos, fountain bush,	Cape Peninsula to Kogelberg	Major eastern extension of range, mountain fynbos, forest margins, riverbeds, **Cape endemic**						1

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
		penwortel								
FABACEAE	Psoralea repens L.		Cape Peninsula to E Cape	No change, coastal fynbos, below 50m						
FABACEAE	Psoralea sp. nov. ABL 15269		No information available	N/A						
FABACEAE	Rhynchosia capensis (Burm.f.) Schinz		Cape Peninsula to E Cape	No change, riverbanks, below 660m						
FABACEAE	Rhynchosia caribaea (Jacq.) DC.		George to tropical Africa	No change, coastal forests, below 600m						
FABACEAE	Rhynchosia chrysoscias Benth. ex Harv.		Caledon to E Cape	No change, sandstone slopes						
FABACEAE	Rhynchosia ciliata (Thunb.) Schinz		Heidelberg to E Cape	No change, sandstone slopes and flats						
FABACEAE	Tephrosia capensis (Jacq.) Pers.		Cape Peninsula to E Cape	No change, sandy or grassy slopes and flats						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
FABACEAE	Virgilia oroboides (P.J.Bergius) T.M.Salter		Cape Peninsula to George	Major eastern extension of distribution, forest margins, streamsides, **Cape endemic**					1	1
FLACOURTIACEAE	Dovyalis rhamnoides (Burch. ex DC.) Burch. & Harv.		George to Mpumalanga	No change, forests and scrub						
FLACOURTIACEAE	Dovyalis rotundifolia (Thunb.) Thunb. & Harv.	duinesuurbessie, dune dovyalis	Humansdorp to E Cape	No change, **coastal dune forest and Cape endemic**					1	
FLACOURTIACEAE	Scolopia zeyheri (Nees) Harv.	doringpeer, thorn pear	Knysna to Mpumalanga	No change, forests and scrub						
FLACOURTIACEAE	Trimeria trinervis Harv.		Knysna to Mpumalanga	No change, forests and scrub forests						
GENTIANACEAE	Chironia baccifera L.	bitterbessiebos, perdebossie	Namaqualand to KwaZulu-Natal	No change, sandy flats and slopes						
GENTIANACEAE	Chironia decumbens Levyns		Cape Peninsula to E Cape	No change, coastal flats and vleis						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
GENTIANACEAE	Chironia peduncularis Lindl.		Knysna to E Cape	No change, damp, shaded places						
GENTIANACEAE	Chironia serpyllifolia Lehm.		Humansdorp to E Cape	No change, damp places						
GENTIANACEAE	Chironia tetragona L.f.		Cape Peninsula to E Cape	No change, coastal sands and limestone						
GENTIANACEAE	Sebaea minutiflora Schinz		Cape Peninsula to E Cape	No change, damp sandy coastal flats						
GERANIACEAE	Geranium ornithopodon Eckl. & Zeyh.		Cape Peninsula to E Cape	No change, damp ground in scrub or forest						
GERANIACEAE	Pelargonium capitatum (L.) L'Hér.	kusmalva, rose-scented pelargonium	Lambert's Bay to KwaZulu-Natal	No change, coastal dunes and flats						
GERANIACEAE	Pelargonium grossularioides (L.) L'Hér.		Clanwilliam to KwaZulu-Natal	No change, damp places						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
GERANIACEAE	Pelargonium suburbanum Clifford ex C.Boucher subsp. suburbanum		Cape Peninsula to Port Elizabeth	No change, **coastal dunes endemic**					1	
GOODENIACEAE	Scaevola plumieri (L.) Vahl		Indo-Pacific coasts to Agulhas	No change, coastal foredunes						
GUNNERACEAE	Gunnera perpensa L.		Swartruggens to Cape Peninsula and Little Karoo, to N Africa	No change, marshes						
ICACINACEAE	Apodytes dimidiata E.Mey. ex Arn. subsp. dimidiata	white pear, witpeer	Cape Peninsula to tropical Africa	No change, rocky slopes and forest						
LAMIACEAE	Leonotis leonurus (L.) R.Br.	duiwelstabak, klipdagga, rivierdagga, rooidagga, wildedagga	Clanwilliam to Gauteng	No change, forest margins or rough grassland						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
LAMIACEAE	Mentha aquatica L.	wild mint	Clanwilliam to Knysna and to Europe	No change, marshes and wet places						
LAMIACEAE	Salvia africana-lutea L.	bruinsalie, sandsalie, strandsalie, wild sage	Namaqualand to E Cape	No change, coastal dunes and slopes						
LAURACEAE	Cassytha ciliolata Nees	false dodder, nooienshaar	Clanwilliam to E Cape	No change, various						
LENTIBULARIACEAE	Utricularia bisquamata Schrank		throughout southern Africa	No change, boggy acid soils						
LINACEAE	Linum africanum L.	African flax	Hopefield to Knysna	Eastern extension of distribution, , sandstone and limestone slopes and flats, **Cape endemic**						
MALVACEAE	Grewia occidentalis L.		Cape Peninsula to Zimbabwe	No change, forest margins and bush						
MALVACEAE	Hermannia saccifera		Riviersonderend Mts and Bredasdorp to E	No change, stony clay slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
	(Turcz.) K.Schum.		Cape							
MALVACEAE	Hermannia velutina DC.		Humansdorp to S KwaZulu-Natal	No change, stony slopes						
MALVACEAE	Hibiscus aethiopicus L.		Elandskloof Mts to KwaZulu-Natal	No change, stony sandstone slopes or clay slopes						
MALVACEAE	Hibiscus diversifolius Jacq.		Plettenberg Bay to tropical Africa	No change, forest margins and bush						
MENISPERMACEAE	Cissampelos capensis L.f.	davidjies, fynblaarklimop	S Namibia and W Karoo to Port Elizabeth	No change, sandy slopes in scrub						
MESEMBRYANTHEMACEAE	Carpobrotus acinaciformis (L.) L.Bolus	elandsvy, Hottentot fig, sour fig, suurvy	Saldanha to Mossel Bay	Major eastern range extension, **coastal dune endemic**					1	1
MESEMBRYANTHEMACEAE	Carpobrotus deliciosus (L.Bolus) L.Bolus		Riversdale to KwaZulu-Natal	No change, sand dunes or rocky grassland						
MESEMBRYANTHEMACEAE	Delosperma patersoniae		Port Elizabeth	Western extension of distribution, calcareous sands, **E coast**				1		1

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
	(L.Bolus) L.Bolus			**endemic**						
MESEMBRYANTHEMACEAE	Drosanthemum hispidum (L.) Schwantes	fyn t'nouroebos	dry parts of southern Africa	No change, pioneer						
MESEMBRYANTHEMACEAE	Mesembryanthemum canaliculatum Haw.	kruipvygie	Cape Peninsula to Port Elizabeth	No change, coastal dune endemic					1	
MESEMBRYANTHEMACEAE	Mesembryanthemum splendens L. subsp. splendens		Worcester to E Cape and Karoo	No change, dry flats and lower slopes						
MOLLUGINACEAE	Pharnaceum dichotomum L.f.		Namaqualand and Karoo to E Cape	No change, dry slopes						
MYRICACEAE	Morella cordifolia (L.) Killick	candle berry, dune waxberry, glashout, wasbessie, waxberry	Yzerfontein to E Cape	No change, coastal sands and limestones						
MYRICACEAE	Morella quercifolia (L.)	maagpynbossie	Namaqualand to E Cape	No change, mostly coastal sandy						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
	Killick			and limestone flats and slopes						
MYRICACEAE	Morella serrata (Lam.) Killick	gammabos, wasbessie, waterolier, waxberry	Bainskloof to Mpumalanga and Caprivi	No change, rocky streamsides						
MYRSINACEAE	Rapanea gilliana (Sond.) Mez	dwarf Cape beech, dwergboekenhout	Humansdorp to E Cape	No change, coastal dune scrub						
MYRSINACEAE	Rapanea melanophloeos (L.) Mez		Cape Peninsula to tropical Africa	No change, forests						
OLEACEAE	Chionanthus foveolatus (E.Mey.) Stearn subsp. foveolatus		Cape Peninsula to Mpumalanga	No change, coastal bush and rocky slopes						
OLEACEAE	Olea capensis L. subsp. capensis	ysterhout	Olifants River Mts to E Cape and to tropical Africa	No change, forest and scrub						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
OLEACEAE	Olea exasperata Jacq.	slanghout	Cape Peninsula to E Cape	No change, coastal scrub on sand and limestone						
ONAGRACEAE	Epilobium capense Buchinger ex Hochst.		Cold Bokkeveld Mts to tropical Africa	No change, damp places						
OROBANCHACEAE	Alectra sessiliflora (Vahl) Kuntze		Gifberg to tropical Africa and Madagascar	No change, damp flats and lower slopes						
OROBANCHACEAE	Harveya purpurea (L.f.) Harv. ex Hook.		Cedarberg Mts to KwaZulu-Natal	No change, lower slopes and flats on sandy soils						
OROBANCHACEAE	Melasma scabrum P.J. Bergius		Cape Peninsula to Mpumalanga	No change, damp mountain slopes						
OXALIDACEAE	Oxalis incarnata L.		Cape Peninsula to Uitenhage	No change, **coastal endemic**					1	
OXALIDACEAE	Oxalis polyphylla Jacq.	fynblaarsuring	Malmesbury to Port Elizabeth	No change, **Cape flats endemic**					1	
OXALIDACEAE	Oxalis purpurea L.	grootsuring	Namaqualand and W Karoo to Port Elizabeth	No change, flats and slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
PLANTAGINACEAE	Plantago crassifolia Forssk.	fleshy plantain	Saldanha Bay to tropical Africa	No change, coastal sands and limestone						
PLUMBAGINACEAE	Limonium scabrum (Thunb.) Kuntze	brakblommetjie, sea lavender	Cape Peninsula to E Cape	No change, coastal dunes and estuaries						
PLUMBAGINACEAE	Limonium sp. nov. ABL 15508		No information available	N/A						
POLYGALACEAE	Muraltia squarrosa (L.f.) DC.		George to Alexandria	No change, sandstone slopes						
POLYGALACEAE	Polygala ericaefolia DC.		George to Port Elizabeth	No change, **SE coastal endemic**					1	
POLYGALACEAE	Polygala microlopha DC.		Montagu to E Cape	No change, rocky sandstone and clay slopes						
POLYGALACEAE	Polygala myrtifolia L.	Septemberbos	Bokkeveld Mts to KwaZulu-Natal	No change, rocky slopes						
POLYGALACEAE	Polygala virgata Thunb.		Swellendam to tropical Africa	No change, sandstone or clay or limestone slopes, often forest						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
				margins						
POLYGONACEAE	Persicaria attenuata (R.Br.) Soják subsp. africana K.L.Wilson		Widespread	No change						
POLYGONACEAE	Rumex acetosella L. subsp. angiocarpus (Murb.) Murb.	boksuring, sheep sorrel	Cosmopolitan weed	No change, disturbed places						
POLYGONACEAE	Rumex lanceolatus Thunb.		Widespread	No change						
POLYGONACEAE	Rumex pulcher L. subsp. divaricatus (L.) Murb.		Western Cape, Eastern Cape	No change						
PROTEACEAE	Leucadendron salignum P.J.Bergius	common sunshine conebush, geelbos, geeltolbos, knopbos, knoppiesbos,	Bokkeveld Mts to Grahamstown	No change, sandy and clay slopes and flats						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
		rooibos, stompieknopbos, sunshine bush								
PROTEACEAE	Protea neriifolia R.Br.	blousuikerbos, blue sugarbush	Kleinwinterhoek Mts to Port Elizabeth	No change, sandstone and clay slopes, **Cape endemic**					1	
RANUNCULACEAE	Clematis brachiata Thunb.		Montagu to Port Elizabeth, widespread in southern and tropical Africa	No change, scrub and forest margins						
RANUNCULACEAE	Knowltonia capensis (L.) Huth		Porterville to Cape Peninsula	Major eastern extension of distribution, shaded rocky slopes, **Cape endemic**					1	
RANUNCULACEAE	Ranunculus multifidus Forssk.	buttercup	Namaqualand to Cape Peninsula to Arabia	No change, damp places						
RHAMNACEAE	Phylica gnidioides Eckl. & Zeyh.		Humansdorp to Grahamstown	No change, dunes and grassy slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
RHAMNACEAE	Phylica litoralis (Eckl. & Zeyh.) D.Dietr.		Knysna to East London	No change, coastal dunes						
RHAMNACEAE	Rhamnus prinoides L'Her.		Riversdale to tropical Africa	No change, riverine scrub and forest margins						
RHAMNACEAE	Scutia myrtina (Burm.f.) Kurz		Cape Peninsula to tropical Africa	No change, forest margins						
ROSACEAE	Cliffortia filifolia L.f.		Malmesbury to Knysna	Major eastern extension of distribution, **Cape flats endemic**						1
ROSACEAE	Cliffortia odorata L.f.	wildewingerd	Clanwilliam to KwaZulu-Natal	No change, sandstone slopes						
ROSACEAE	Cliffortia paucistaminea Weim.		George to KwaZulu-Natal	No change, lower mountain slopes						
ROSACEAE	Rubus rigidus Sm.		Clanwilliam to tropical Africa	No change, forest margins						
RUBIACEAE	Anthospermum aethiopicum L.		Bokkeveld Escarpment to E Cape	No change, clay slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
RUBIACEAE	Anthospermum herbaceum L.f.		Hermanus to N Africa	No change, scrub and damp thickets						
RUBIACEAE	Anthospermum prostratum Sond.		Saldanha to Port Elizabeth	No change, **coastal dune endemic**					1	
RUBIACEAE	Anthospermum spathulatum Spreng.	skaapbos	Namaqualand to E Cape	No change, sandy soils						
RUBIACEAE	Canthium spinosum (Klotzsch) Kuntze		Humansdorp to KwaZulu-Natal	No change, coastal forests						
RUBIACEAE	Galopina circaeoides Thunb.		Riviersonderend Mts to tropical Africa	No change, forests or damp scrub						
RUBIACEAE	Psydrax obovata Eckl. & Zeyh. subsp. obovata		Humansdorp to Zimbabwe	No change, coastal dunes						
RUTACEAE	Agathosma apiculata G.Mey.		Riversdale to Port Alfred	No change, coastal dunes, clays, granite and limestone						
RUTACEAE	Agathosma sp. nov. ABL 15400		No information available	N/A						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
RUTACEAE	Agathosma stenopetala (Steud.) Steud.		Humansdorp to Port Elizabeth	No change, **coastal limestone hills and SE coastal endemic**		1				
RUTACEAE	Clausena anisata (Willd.) Hook.f. ex Benth.	horsewood, perdepis	Riversdale to tropical Africa	No change, evergreen forests						
RUTACEAE	Zanthoxylum capense (Thunb.) Harv.	kleinperdepram, small knobwood	George to tropical Africa	No change, evergreen forests						
SALVADORACEAE	Azima tetracantha Lam.		Cape Infanta to tropical Africa	No change, lowland scrub and bush						
SANTALACEAE	Osyris compressa (P.J.Bergius) A.DC.	pruimbas	Cedarberg Mts to tropical Africa	No change, sandstone slopes						
SANTALACEAE	Rhoiacarpos capensis (Harv.) A.DC.		Mossel Bay to KwaZulu-Natal	No change, coastal bush						
SANTALACEAE	Thesidium fragile (Thunb.) Sond.	breekgroenbasbossie	Little Karoo, Saldanha Bay to E Cape	No change, sandy flats and slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
SANTALACEAE	Thesium commutatum Sond.		Cold Bokkeveld to Uitenhage	No change, flats and slopes, **Cape endemic**					1	
SAPINDACEAE	Allophylus decipiens (Sond.) Radlk.		Gourits River to Mpumalanga	No change, coastal bush						
SAPOTACEAE	Sideroxylon inerme L. subsp. inerme		Cape Peninsula to tropical Africa	No change, sand dunes and coastal bush						
SCROPHULARIACEAE	Chaenostoma campanulatum (Benth.) Kuntze		Stilbaai to Port Alfred	No change, sandy places in scrub or grassland						
SCROPHULARIACEAE	Chaenostoma hispidum (Thunb.) Druce		Cape Peninsula to Bredasdorp	Major eastern extension of distribution, rocky sandstone or limestone, limestone endemic					1	
SCROPHULARIACEAE	Dischisma ciliatum (P.J.Bergius) Choisy		Lokenberg to Port Elizabeth	No change, rocky slopes and flats						
SCROPHULARIACEAE	Hebenstretia cordata L.	kusslakblom	Namaqualand to Port Alfred	No change, coastal dunes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
SCROPHULARIACEAE	Hebenstretia integrifolia L.		Namibia to E Cape	No change, rocky soils, often in grassland						
SCROPHULARIACEAE	Jamesbrittenia microphylla (L.f.) Hilliard		Knysna to Port Alfred	No change, coastal scrub or grassland						
SCROPHULARIACEAE	Manulea obovata Benth.		Humansdorp to Port Alfred	No change, sand dunes or coastal scrub						
SCROPHULARIACEAE	Selago canescens L.f.		Bellville to Port Elizabeth	No change, dry, clay slopes, **Cape endemic**					1	
SCROPHULARIACEAE	Selago rotundifolia L.f.		Knysna to Port Elizabeth	No change, grassy flats, **SE coastal endemic**					1	
SCROPHULARIACEAE	Veronica anagallis-aquatica L.		widespread through southern Africa, probably introduced from Europe	No change,						
SCROPHULARIACEAE	Zaluzianskya maritima (L.f.) Walp.		George to E Cape	No change, **SE coastal dunes endemic**					1	

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
SOLANACEAE	Solanum africanum Mill.	dronkbessie, dronktou, melkellie	Cape Peninsula to KwaZulu-Natal	No change, coastal dunes in bush						
SOLANACEAE	Solanum linnaeanum Hepper & E.Jaeger	gifappel	Worcester and Darling to KwaZulu-Natal	No change, rocky slopes and flats and roadsides						
STILBACEAE	Halleria lucida L.	tree fuschia	Gifberg to tropical Africa	No change, inland or coastal bush or forests						
THYMELAEACEAE	Gnidia stypheloides Meisn.		Humansdorp to E Cape	No change, lower and middle slopes						
THYMELAEACEAE	Passerina corymbosa Eckl. ex C.H.Wright	sandgannabos	Tulbagh to E Cape	No change, sandy, often disturbed flats and slopes						
THYMELAEACEAE	Passerina rigida Wikstr.	gonnabas	Cape Peninsula to KwaZulu-Natal	No change, coastal dunes						
THYMELAEACEAE	Struthiola argentea Lehm.		Hottentots Holland Mts and Montagu to E Cape	No change, coastal flats or slopes						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
Urticaceae	Droguetia iners (Forssk.) Schweinf.		Cape Peninsula to Indonesia	No change, coastal forest, scrub, and among rocks						
VISCACEAE	Viscum obscurum Thunb.		Touwsrivier to KwaZulu-Natal	No change, parasitic						
VITACEAE	Cyphostemma cirrhosum (Thunb.) Desc. ex Wild & R.B.Drumm.		Port Elizabeth to KwaZulu-Natal	No change, coastal bush						
VITACEAE	Rhoicissus digitata (L.f.) Gilg & M.Brandt		Betty's Bay to Mozambique	No change, coastal dunes						
VITACEAE	Rhoicissus tomentosa (Lam.) Wild & R.B.Drumm.		Knysna to Tanzania	No change, forests						
VITACEAE	Rhoicissus tridentata (L.f.) Wild & R.B.Drumm.		Riversdale to E Cape	No change, scrub						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

Family	Species name	Common names	Distribution GM	Comments	Regional endemic	Regional and habitat endemic	Local endemic	Local and habitat endemic	>100km range and habitat endemic	Range extension
ZYGOPHYLLACEAE	Roepera maritima Sond.		Bredasdorp to Grahamstown	No change, coastal sands and limestone among scrub						
Monocotyledons										
AMARYLLIDACEAE	Boophone disticha (L.f.) Herb.		Robertson and Bredasdorp to tropical E Africa	No change, rocky slopes and flats						
AMARYLLIDACEAE	Brunsvigia gregaria R.A.Dyer		Humansdorp to E Cape	No change, clay soils						
AMARYLLIDACEAE	Cyrtanthus loddigesianus (Herb.) R.A.Dyer	grasveldlelie, sandlelie	Humansdorp to E Cape	No change, grassland or grassy fynbos in sandy soils						
AMARYLLIDACEAE	Scadoxus puniceus (L.) Friis & Nordal		Stilbaai to tropical Africa	No change, coastal bush						
ARACEAE	Zantedeschia aethiopica	arum, arum lily, calla lily, pig lily,	Richtersveld, Kamiesberg, Bokkeveld	No change, sandy or rocky						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

	(L.) Spreng.	varkblom	Mts to N Province	places, usually seasonally damp						
ASPARAGACEAE	Asparagus aethiopicus L.		Namaqualand to Transkei	No change, dry bush						
ASPARAGACEAE	Asparagus africanus Lam.		Saldanha to N KwaZulu-Natal	No change, moist places						
ASPARAGACEAE	Asparagus asparagoides (L.) Druce	breëblaarklimop, breëblaarkransie, krulkransie	Gifberg to Port Elizabeth to tropical Africa	No change, widespread in bush						
ASPARAGACEAE	Asparagus racemosus Willd.		Widespread	No change						
ASPARAGACEAE	Asparagus virgatus Baker		Widespread	No change						
ASPHODELACEAE	Gasteria acinacifolia (Jacq.) Haw.	bontaalwyn	Knysna to Port Alfred	No change, coastal dune thicket						
ASPHODELACEAE	Kniphofia rooperi (T.Moore) Lem.		KwaZulu Natal, E Cape	No change						
ASPHODELACEAE	Trachyandra ciliata (L.f.) Kunth	hotnotskool, wildeblomkool	Namibia to Grahamstown	No change, damp sandy coastal flats						
BEHNIACEAE	Behnia reticulata (Thunb.) Didr.	African Solomon's seal	Knysna to Zimbabwe	No change, forests and scrub						
COLCHICACEAE	Colchicum eucomoides (Jacq.) J.C.Manning & Vinnersten		Namaqualand to E Cape	No change, clay flats and slopes						
CYPERACEAE	Bolboschoenus	sedge, snygras,	Clanwilliam to tropical	No change, marshy flats near						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

	maritimus (L.) Palla	snyruigte	Africa, pantropical	water, mainly coastal						
CYPERACEAE	Carex aethiopica Schkuhr		Cape Peninsula to E Cape	No change, shady areas near water in forest						
CYPERACEAE	Cladium mariscus (L.) Pohl subsp. jamaicense (Crantz) Kuekenth.		sporadic throughout SA and nearly cosmopolitan	No change, marshy flats and watercourses						
CYPERACEAE	Cyperus longus L.	dooiwortel, waterbiesie, waterkweek	Clanwilliam to Avontuur, widespread in southern and tropical Africa	No change, damp flats and watercourses						
CYPERACEAE	Cyperus natalensis Hochst.		KwaZulu Natal	Southern extension of distribution						1
CYPERACEAE	Cyperus sphaerospermus Schrad.		Clanwilliam to Uitenhage, widespread in southern Africa	No change, marshes and watercourses						
CYPERACEAE	Cyperus thunbergii Vahl		Namaqualand to E Cape	No change, near water below 500m						
CYPERACEAE	Eleocharis limosa (Schrad.) Schult.		Namibia to Cape Peninsula to KwaZulu-Natal, Madagascar	No change, pools and marshes						
CYPERACEAE	Ficinia bulbosa (L.) Nees		Cedarberg Mts to E Cape	No change, strandveld, coastal and mountain fynbos						
CYPERACEAE	Ficinia capitella (Thunb.) Nees		W Karoo, Ceres to Caledon	Major eastern extension of distribution, flats and slopes below 1700m						1
CYPERACEAE	Ficinia dunensis Levyns		Cedarberg Mts to Port	No change, coastal dunes or					1	

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

			Elizabeth	mountain slopes, **Cape endemic**						
CYPERACEAE	Ficinia indica (Lam.) Pfeiffer	knoppiesbiesie	Namaqualand to E Cape	No change, flats and lower slopes						
CYPERACEAE	Ficinia lateralis (Vahl) Kunth		Cape Peninsula to E Cape	No change, coastal dunes						
CYPERACEAE	Ficinia nodosa (Rottb.) Goetgh.	steekbiesie, vleibiesie	Namaqualand to KwaZulu-Natal and widespread in S hemisphere	No change, damp sandy flats and coastal areas to 250m						
CYPERACEAE	Ficinia ramosissima Kunth		Cape Peninsula to E Cape	No change, lower slopes and rock crevices in shade						
CYPERACEAE	Fuirena coerulescens Steud.		Cape Peninsula to northern SA	No change, marshy flats and lower slopes below 100m						
CYPERACEAE	Fuirena hirsuta (P.J.Bergius) P.L.Forbes		Namaqualand to Mpumalanga	No change, marshy flats and watercourses on lower slopes to 1000m						
CYPERACEAE	Isolepis cernua (Vahl) Roem. & Schult.		Cape Peninsula to Port Elizabeth, cosmopolitan	No change, marshes and watercourses						
CYPERACEAE	Isolepis marginata (Thunb.) A.Dietr.		Namaqualand to E Cape, also Australia	No change, dunes, flats and slopes in seasonally damp sandy soil						
CYPERACEAE	Isolepis prolifera R.Br.		Namaqualand to KwaZulu-Natal, Australasia, St. Helena	No change, streamsides and seeps below 1000m						
CYPERACEAE	Isolepis rubicunda Kunth		Langebaan to Cape	Major eastern extension of distribution, seasonal pools on						1

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

			Peninsula	flats or lower slopes, **SW coast endemic**						
CYPERACEAE	Neesenbeckia punctoria (Vahl) Levyns		Cape Peninsula to Caledon	Major eastern extension of distribution, streamsides on lower slopes to 800m, **SW Cape endemic**						1
CYPERACEAE	Scirpoides thunbergii (Schrad.) Soják	steekbiesie	Cape Peninsula to E Cape	No change, damp flats near coast up to 300m						
CYPERACEAE	Tetraria brachyphylla Levyns		Cape Peninsula to Plettenberg Bay	Eastern extension of distribution, **coastal dunes endemic**					1	
CYPERACEAE	Tetraria bromoides (Lam.) Pfeiffer	bergpalmiet	Porterville to Cape Peninsula to Uitenhage	No change, **mountain fynbos endemic**					1	
CYPERACEAE	Tetraria cuspidata (Rottb.) C.B.Clarke		Cedarberg Mts to Cape Peninsula to Mpumalanga	No change, mountain slopes						
DIOSCOREACEAE	Dioscorea sylvatica (Kunth) Eckl.	elephants foot, hottentotsbrood	Plettenberg Bay to tropical Africa	No change, bush or forest						
HAEMODORACEAE	Wachendorfia paniculata Burm.	koffiepit, rooikanol, spinnekopblom	Bokkeveld Mts to Port Elizabeth	No change, sandstone soils, **Cape endemic**						
HEMEROCALLIDACEAE	Caesia contorta (L.f.) T.Durand & Schinz	sokkiesblom	Namaqualand to Stutterheim	No change, sandstone slopes						
HYACINTHACEAE	Albuca cooperi Baker	blougif, geldbeursie	Richtersveld and W Karoo to Cape Peninsula to Willowmore	Slight south eastern extension of distribution, stony, mostly slopes and flats, sometimes limestone						1

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

HYACINTHACEAE	Drimia hesperantha J.C.Manning & Goldblatt		Du Toitskloof to De Hoop	Major eastern extension of distribution, rocky slopes and flats, endemic					1	1
HYACINTHACEAE	Ornithogalum graminifolium Thunb.		W Karoo and Bokkeveld Mts to KwaZulu-Natal	No change, stony clay flats and slopes, often moist sites						
IRIDACEAE	Aristea ecklonii Baker		Humansdorp to Uganda and Cameroon	No change, coastal and montane, mostly forest margins						
IRIDACEAE	Chasmanthe aethiopica (L.) N.E.Br.	kleinpiempiempie, suurkanolpypie	Darling to E Cape	No change, hills and flats on granite, sandstone, or shale, mainly coastal in bush or forest margins						
IRIDACEAE	Gladiolus floribundus Jacq.		Cedarberg Mts to Alexandria	No change, coastal and montane on sandstone and granite						
IRIDACEAE	Gladiolus wilsonii (Baker) Goldblatt & J.C.Manning		Humansdorp to E Cape	No change						
IRIDACEAE	Melasphaerula ramosa (L.) N.E.Br.	baardmannetjie, bokbaardjie, feëklokkie	S Namibia to De Hoop and Swartberg Mts	Eastern extension of distribution, mostly sheltered sites on sandstone or limestone slopes						1
IRIDACEAE	Moraea elliotii Baker		Mossel Bay to Malawi	No change, grassy sandstone slopes						
IRIDACEAE	Moraea setifolia (L.f.) Druce	basterbloutulp, bokuintjie, knikkertjies, papieruintjie	Namaqualand to Grahamstown	No change, sandy and gravelly flats and slopes						
IRIDACEAE	Romulea rosea (L.)	froetang, frutang, knikker,	Bokkeveld Mts to Port	No change, sandy and clay					1	

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

	Eckl.	knikkertjie, rooiknikkertjie	Elizabeth and W Karoo	slopes and flats, **endemic**						
IRIDACEAE	Tritoniopsis caffra (Ker Gawl. ex Baker) Goldblatt		Heidelberg to East London	No change, sandstone slopes						
IRIDACEAE	Watsonia angusta Ker Gawl.	patryskos, rooikanolpypie	Cedarberg Mts to S KwaZulu-Natal	No change, montane marshes and stream banks in fynbos						
JUNCACEAE	Juncus capensis Thunb.		Clanwilliam to E Cape	No change, damp flats and lower slopes						
JUNCACEAE	Juncus kraussii Hochst. subsp. kraussii	biesie, rush	Cape Peninsula to Mozambique, Australia, S America	No change, saline marshes						
JUNCACEAE	Juncus lomatophyllus Spreng.		Clanwilliam to Zimbabwe	No change, streamsides, marshes and seeps						
JUNCAGINACEAE	Triglochin striata Ruiz & Pav.		Clanwilliam to E Cape and more or less worldwide	No change, marshes and seeps						
LANARIACEAE	Lanaria lanata (L.) T.Durand & Schinz	Cape eidelweiss, kapokblom, perdekapok	Bainskloof to E Cape	No change, clay and sandstone slopes						
ORCHIDACEAE	Acrolophia cochlearis (Lindl.) Schltr. & Bolus		Bredasdorp to KwaZulu-Natal	No change, rocky grassland						
ORCHIDACEAE	Bonatea speciosa (L.f.) Willd. var. speciosa	moederkappie, Oktoberlelie	Yzerfontein to Zimbabwe	No change, coastal scrub and forest margins						
ORCHIDACEAE	Disa chrysostachya Sw.		Knysna to N Province	No change, damp or marshy						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

				grassland						
ORCHIDACEAE	Eulophia speciosa (R.Br. ex Lindl.) Bolus		Wilderness to tropical Africa	No change, coastal bushveld						
ORCHIDACEAE	Holothrix villosa Lindl.	wollie	Richtersveld and W Karoo to E Cape	No change, sandstone and granite slopes						
ORCHIDACEAE	Satyrium hallackii Bolus subsp. hallackii		Cape Peninsula to Betty's Bay, Port Elizabeth to N Province	No change, coastal flats and inland marshes						
ORCHIDACEAE	Satyrium membranaceum Sw.		Swellendam to E Cape and Lesotho	No change, grassy slopes						
ORCHIDACEAE	Satyrium parviflorum Sw.		Mossel Bay to N Province	No change, sandy flats and marshy grassland						
ORCHIDACEAE	Satyrium princeps Bolus	rooitrewwa	Wilderness to Port Elizabeth	No change, **coastal dune and SE coast endemic**					1	
POACEAE	Cynodon dactylon (L.) Pers.	Bermuda grass, couch, fine quick grass, fynkweek, gewone kweekgras	throughout Africa	No change, mountains and flats						
POACEAE	Ehrharta calycina Sm.	common ehrharta, polgras, rooigras, rooisaadgras	Namaqualand to KwaZulu-Natal	No change, flats and slopes						
POACEAE	Ehrharta erecta Lam.		Cape Peninsula to E Africa	No change, shady habitats, often weedy						
POACEAE	Ehrharta villosa Schult.f.	pypgras	St. Helena Bay to Port	No change, **coastal dune and SE**					1	

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

	var. maxima		Elizabeth	**coast endemic**						
POACEAE	Ehrharta villosa Schult.f. var. villosa	pypgras	St. Helena Bay to Port Elizabeth	No change, **coastal dune and SE coast endemic**					1	
POACEAE	Imperata cylindrica (L.) Raeuschel	beddinggras, cotton-wool grass, donsgras, silwergaargras, sygras	tropical African weed	No change, wet habitats						
POACEAE	Melica decumbens Thunb.		Widespread in S Africa	No change						
POACEAE	Merxmuellera cincta (Nees) Conert subsp. sericea N.P.Barker		Olifants River Mts to E Cape	No change, streamsides						
POACEAE	Panicum maximum Jacq.	Guinea grass, purple-top buffalo	Cape Peninsula to tropical Africa	No change, shady places						
POACEAE	Pentaschistis pallida (Thunb.) H.P.Linder	duinegras, haasgras	Namaqualand to E Cape	No change, slopes and flats						
POACEAE	Phragmites australis (Cav.) Trin. ex Steud.	common reed, fluitjiesriet	worldwide	No change, marshes, streams and seeps						
POACEAE	Polypogon strictus Nees		Saldanha to E Cape	No change, wet places						
POACEAE	Setaria sphacelata (Schum.) Stapf & C.E.Hubb. ex Moss var. Sphacelata	bristle grass, golden timothy, kanariegras	Cape Peninsula to tropical Africa	No change, disturbed areas						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

POACEAE	Sporobolus virginicus (L.) Kunth	brakgras, brakkweek, sea rush grass	worldwide	No change, dunes, beaches and coastal marshes						
POACEAE	Stenotaphrum secundatum (Walter) Kuntze	buffalo grass, buffelsgras, kweekgras	Cape Peninsula to pantropical	No change, sandy coastal slopes and flats						
POACEAE	Themeda triandra Forssk.	red grass, rooigras	throughout tropical Africa and Asia	No change, grassland						
POACEAE	Tribolium hispidum (Thunb.) Desv.	haasgras	Namaqualand to E Cape	No change, flats and slopes						
POTAMOGETONACEAE	Potamogeton pusillus L.	fonteingras, fonteinkruid	Africa and N hemisphere	No change, fresh water						
RESTIONACEAE	Elegia microcarpa (Kunth) Pillans		Melkbos to Port Elizabeth	No change, **coastal dune and limestone endemic**					1	
RESTIONACEAE	Hypodiscus striatus (Kunth) Mast.		Namaqualand to Port Elizabeth	No change						
RESTIONACEAE	Ischyrolepis eleocharis (Nees ex Mast.) H.P.Linder	katstert, katstertriet	Cape Peninsula to Port Elizabeth	No change, **coastal dune and limestone endemic**					1	
RESTIONACEAE	Ischyrolepis leptoclados (Mast.) H.P.Linder	besemriet	Betty's Bay to Knysna	Major eastern extension of distribution, **coastal dunes endemic**					1	
RESTIONACEAE	Restio triticeus Rottb.	besemgoed, besemriet, kanet	Malmesbury to E Cape	No change, habitat?						
RESTIONACEAE	Thamnochortus	besemriet	Tulbagh to KwaZulu-	No change, habitat?						

APPENDIX 4.3.3. DISTRIBUTION OF SPECIES RECORDED AT THYSPUNT: ENDEMICS

	fruticosus P.J.Bergius		Natal							
TYPHACEAE	Typha capensis (Rohrb.) N.E.Br.	bulrush, matjiesgoed, papkuil	southern and tropical Africa	No change, stream banks and marshes						
TOTAL					0	3	0	1	44	24

APPENDIX 4.3.4. CALCULATION OF RARITY & SENSITIVITY AT THYSPUNT

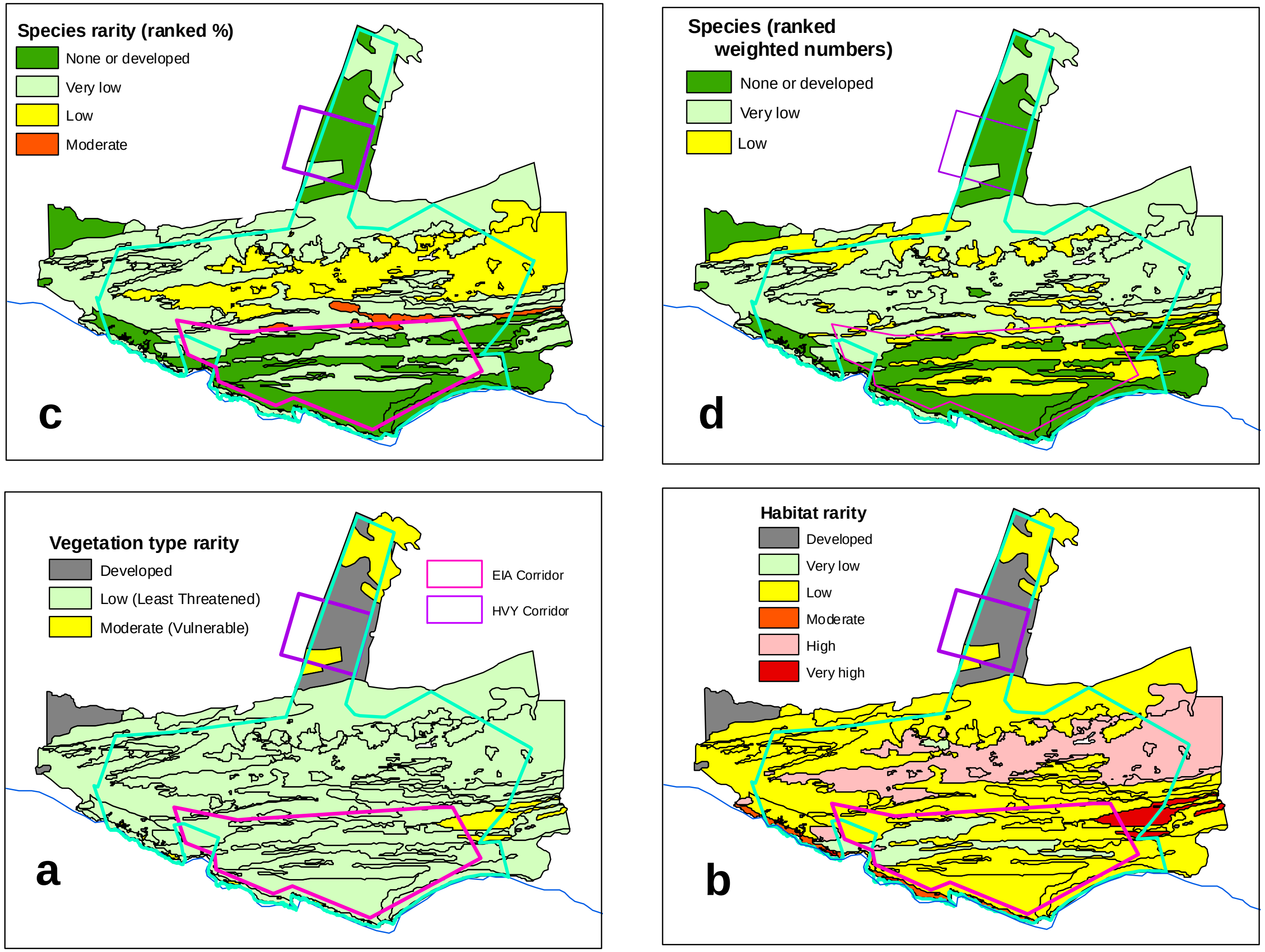
			Rarity										Sensitivity					
Plant community no.	**Description**	**Vegetation type**	**Conservation status**	**No. red data species**	**Veg type**	**Habitat**	**% RD species**	**Species rarity rating**	**Weighted species rarity**	**Weighted class**	**Overall rarity rating**	**Rarity class**	**Erosion**	**Fire**	**Droughting**	**Resilience**	**Total sensitivity**	**Sensitivity class**
T1	Rocky shore vegetation: shallow calcareous sand over sandstone	Cape Seashore Vegetation	LT	2	1	3	3.2	1	4	1	12	3	3	2	2	3	19	3
T2	Primary dune vegetation at coast	Cape Seashore Vegetation	LT	0	1	2	0.0	0	0	0	8	2	5	1	1	4	24	4
T3	Dune fynbos on inland transverse dunes	Southern Cape Dune Fynbos	LT	2	1	4	6.3	2	4	1	15	3	4	2	2	4	24	4
T4	Dwarf dune thicket on calcareous sands of ;parabolic dunes near coast	Algoa Dune Strandveld	LT	0	1	2	0.0	0	0	0	8	2	3	1	1	2	14	3
T5	Tall dune thicket on calcareous sands of parabolic dunes in middle of site	Algoa Dune Strandveld	LT	1	1	2	2.3	1	4	1	9	2	3	2	2	2	16	3
T6	Dune forest on	Algoa Dune	LT	1	1	4	2.4	1	3	1	15	3	3	3	2	5	26	4

APPENDIX 4.3.4. CALCULATION OF RARITY & SENSITIVITY AT THYSPUNT

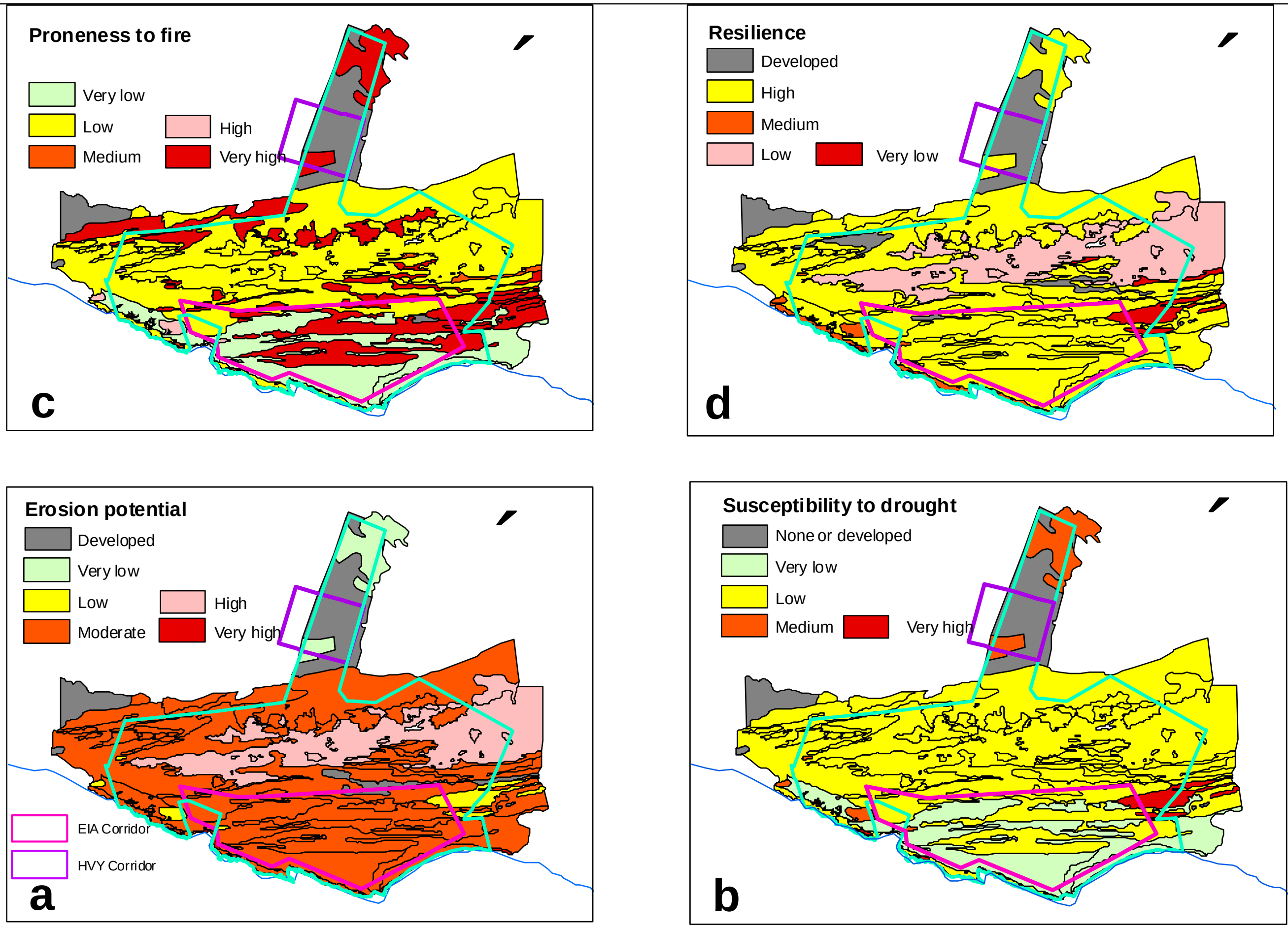
			Rarity									Sensitivity					
Plant community no.	Description	Vegetation type	Conservation status	No. red data species	Veg type	Habitat	% RD species	Species rarity rating	Weighted species rarity	Weighted class	Overall rarity rating	Rarity class	Erosion	Fire	Droughting	Resilience	Total sensitivity	Sensitivity class
	calcareous sands of inland parabolic dunes	Strandveld (Southern Coastal Forest)	(LT)															
T7	Dune fynbos on calcareous sands of parabolic dunes near coast	Southern Cape Dune Fynbos	LT (LT)	5	1	2	3.5	1	17	2	10	2	3	5	2	2	19	3
T8	Fynbos on limestone near coast	Algoa Dune Strandveld (no equivalent, but has links with Southern Cape Dune Fynbos)	LT (LT)	4	1	4	5.4	2	10	1	15	3	2	4	3	3	20	3
T9	Mountain fynbos on inland sandstone	Tsitsikamma Sandstone Fynbos	V	1	2	2	2.0	1	2	1	11	3	1	5	3	2	16	3
T10A	Wetland at coast above high-water mark	Cape Seashore Vegetation	LT	1	1	5	1.9	1	3	1	18	4	3	3	5	5	29	4
T10B	Wetland in dune slack near coast (Langefontein)	Algoa Dune Strandveld (Cape Lowland Freshwater Wetlands)	LT (V)	0	2	5	0.0	0	0	0	19	4	2	5	5	5	29	4

APPENDIX 4.3.4. CALCULATION OF RARITY & SENSITIVITY AT THYSPUNT

			Rarity										Sensitivity					
Plant community no.	Description	Vegetation type	Conservation status	No. red data species	Veg type	Habitat	% RD species	Species rarity rating	Weighted species rarity	Weighted class	Overall rarity rating	Rarity class	Erosion	Fire	Droughting	Resilience	Total sensitivity	Sensitivity class
T10C	Wetland on inland transverse dunes	Algoa Dune Strandveld (Cape Lowland Freshwater Wetlands)	LT (V)	3	2	5	7.0	2	8	1	20	4	5	3	5	5	33	5
T10D	Wetland on northern edge of inland transverse dunes	Southern Cape Dune Fynbos (Algoa Dune Strandveld) (Cape Lowland Freshwater Wetlands)	LT (LT) (V)	1	2	5	2.9	1	3	1	20	4	5	4	5	5	34	5
T10E	Wetland in middle of Slangrivier system	Algoa Dune Strandveld (Cape Lowland Freshwater Wetlands)	LT (V)	3	1	5	7.1	2	8	1	18	4	5	5	5	5	35	5
T10F	Streamline on lower Slangrivier system	Tsitsikamma Sandstone Fynbos (Cape Lowland Freshwater Wetlands)	V (V)	0	2	5	0.0	0	0	0	19	4	5	5	5	5	35	5
T10G	Wetland on lower Slangrivier system	Tsitsikamma Sandstone Fynbos (Cape Lowland Freshwater Wetlands)	V (V)	0	2	5	0.0	0	0	0	19	4	5	5	5	5	35	5



Appendix 4.3.5. Rarity at Thyspunt, showing position of nuclear power station footprints. a: vegetation type; b: habitat; c: species (%); d: species (weighted numbers). Rarity calculated from values in Appendix 4.3.4.



Appendix 4.3.6. Ecological sensitivity at Thyspunt, showing proposed nuclear power station footprints. a: erosion potential; b: susceptibility to droughting; c: proneness to fire; d: plant community resilience. Sensitivity calculated from values in Appendix 4.3.4

APPENDIX 7.1.1. IMPACT ASSESSMENT CRITERIA AND RATING SCALES

Criteria	Rating Scales	Notes
Nature	*Positive*	*This is an evaluation of the type of effect the construction, operation and management of the proposed NPS development would have on the affected environment.*
	Negative	
	Neutral	
Extent	*Low*	*Site-specific, affects only the development footprint*
	Medium	*Local (limited to the site and its immediate surroundings, including the surrounding towns and settlements within a 10 km radius);*
	High	*Regional (beyond a 10 km radius) to national*
Duration	*Low*	*0-3 years*
	Medium	*4-8 years*
	High	*9 years to permanent*
Intensity	*Low*	*Where the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*
	Medium	*Where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected*
	High	*Where natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.*
Potential for impact on irreplaceable resources	*Low*	*No irreplaceable resources will be impacted.*
	Medium	*Resources that will be impacted can be replaced, with effort.*
	High	*There is a high potential that irreplaceable resources will be lost.*
Consequence (a combination of extent, duration, intensity and the potential for impact on irreplaceable resources).	*Low*	*A combination of any of the following* • *Intensity, duration, extent and impact on irreplaceable resources are all rated low* • *Intensity is low and up to two of the other criteria are rated medium* • *Intensity is medium and all three other criteria are rated low*

Criteria	Rating Scales	Notes
	Medium	• ***Intensity is medium and at least two of the other criteria are rated medium***
	High	• ***Intensity and impact on irreplaceable resources are rated high, with any combination of extent and duration*** • ***Intensity is rated high, with all of the other criteria being rated medium or higher.***
Probability (the likelihood of the impact occurring)	***Low***	***It is highly unlikely or less than 50 % likely that an impact will occur.***
	Medium	***It is between 50 and 74 % certain that the impact will occur.***
	High	***It is more than 75 % certain that the impact will occur or it is definite that the impact will occur.***
Significance (all impacts including potential cumulative impacts)	***Low***	• ***Low consequence and low probability*** • ***Low consequence and medium probability***
	Low to medium	• ***Low consequence and high probability*** • ***Medium consequence and low probability***
	Medium	• ***Medium consequence and medium probability*** • ***Medium consequence and high probability*** • ***High consequence and low probability***
	Medium to high	• ***High consequence and medium probability***
	High	• ***High consequence and high probability***

APPENDIX 7.2. EXPLANATION OF RED DATA SPECIES CATEGORIES

Go To Link*:* IUCN Red List *Categories and* Criteria*: Version 3.1 - redlist en cov*