CHAPTER 7: PRIORITY AREAS FOR CONSERVATION PLANNING

7.1 Conservation hotspots of the western Central Bushveld Bioregion

Areas that combine both high levels of plant diversity and great current or future threat of vegetation transformation, need to be identified and prioritized for conservation (Reyers, 2004). From the assessment of the western Central Bushveld (WCB) Bioregion we have learned that large areas are still untransformed and harbour a rich phyto-diversity. However, these species-rich areas are endangered by land-use change, most notably by crop cultivation, urbanisation and mining. Economic and population growth in South Africa will necessitate the expansion of resource extraction, commercial and subsistence farming (Reyers, 2004).

A high future threat exists for the large areas of arable land in the WCB that are not yet used for agriculture (figure 5.55; chapter 5). A high concern in this regard exists particularly for the proposed Heritage Park. Phyto-diversity is already at stake through farming in agricultural marginal land, particularly in the Zeerust and Swartruggens region south of the study area (figure 5.56; chapter 6). Furthermore, there is a great likelihood for further mining and associated industrial activities along the Rustenburg Layered Suite for the extraction of platinum-group metals, which will put the associated rich plant diversity at risk.

These areas of high phyto-diversity and vulnerability value in the western Central Bushveld have been identified (figure 7.1). The hotspot analysis identifies the region between Pilanesberg, Rustenburg and Brits as an area of prime conservation value. A striking 50% to 100% of the WCB flora is concentrated in this area. Species richness increases towards the Magaliesberg Nature Reserve. However, this extraordinary plant species richness exists on agriculturally arable soils overlying industrially important resources of platinum-group metals, and is thus critically threatened by future land-use change.

Furthermore, the region around Zeerust, Brits and west of the Borakalalo Nature Reserve has been recognized as an important conservation hotspot as well. It holds 50% to 70% of the western Central Bushveld phyto-diversity, which is endangered due to expected future expansion of commercial farming on arable and agriculturally marginal land.

In the Zeerust and Brits area further land-use threats are expected from mining and quarrying. The dolomite and shale layers of the Transvaal Supergroup contain industrially important

resources of fluorspar, limestone and slate; whereas widespread quarrying of granite from the Bushveld Granites takes place in the area between Rustenburg and Brits (Council for Geoscience, 2011; South Africa, 2011).

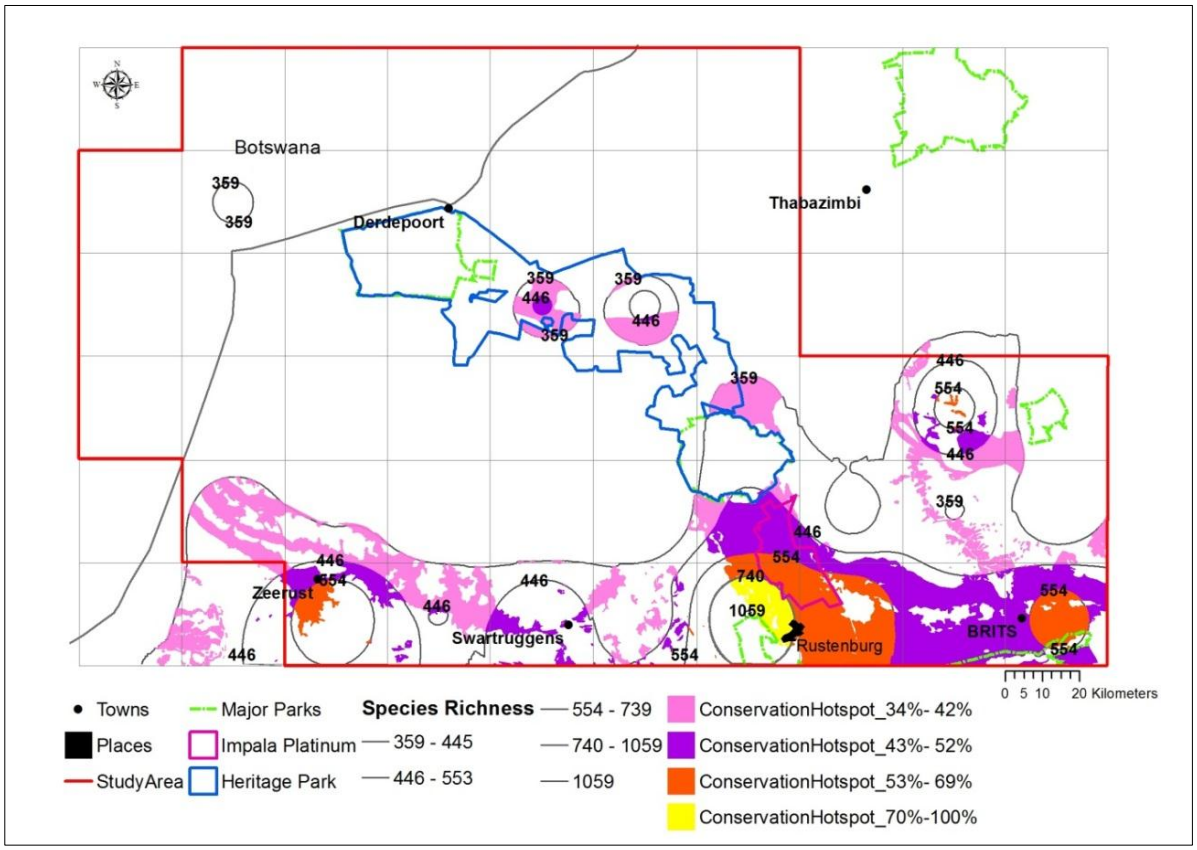

Figure 7.1: Conservation hotspots with outstanding plant species richness which is subject to a substantial present and future threat as a result of land-use change.

The demarcated conservation hotspots of plant diversity (figure 7.1) correspond well with those identified for endemic and Red Data plant species in the WCB (figure 7.2). However, species conservation hotspots are not a good benchmark for the conservation of Protected Trees and useful plant species of social, cultural and medical value (figure 7.2 and 7.3).

The hotspot analysis classifies the Heritage Park as a region of secondary conservation importance for the conservation of plant species richness, only 34% to 52% of the WCB phyto-diversity is found there (figure 7.1). But the proposed conservation initiative stretches across vast areas of arable land that harbours an important representation of the regional flora that should be protected (see chapter 7.2). For example, the Heritage Park has been identified as a hotspot for Red Data, Protected Tree and useful plant species (figure 7.2 and 7.3).

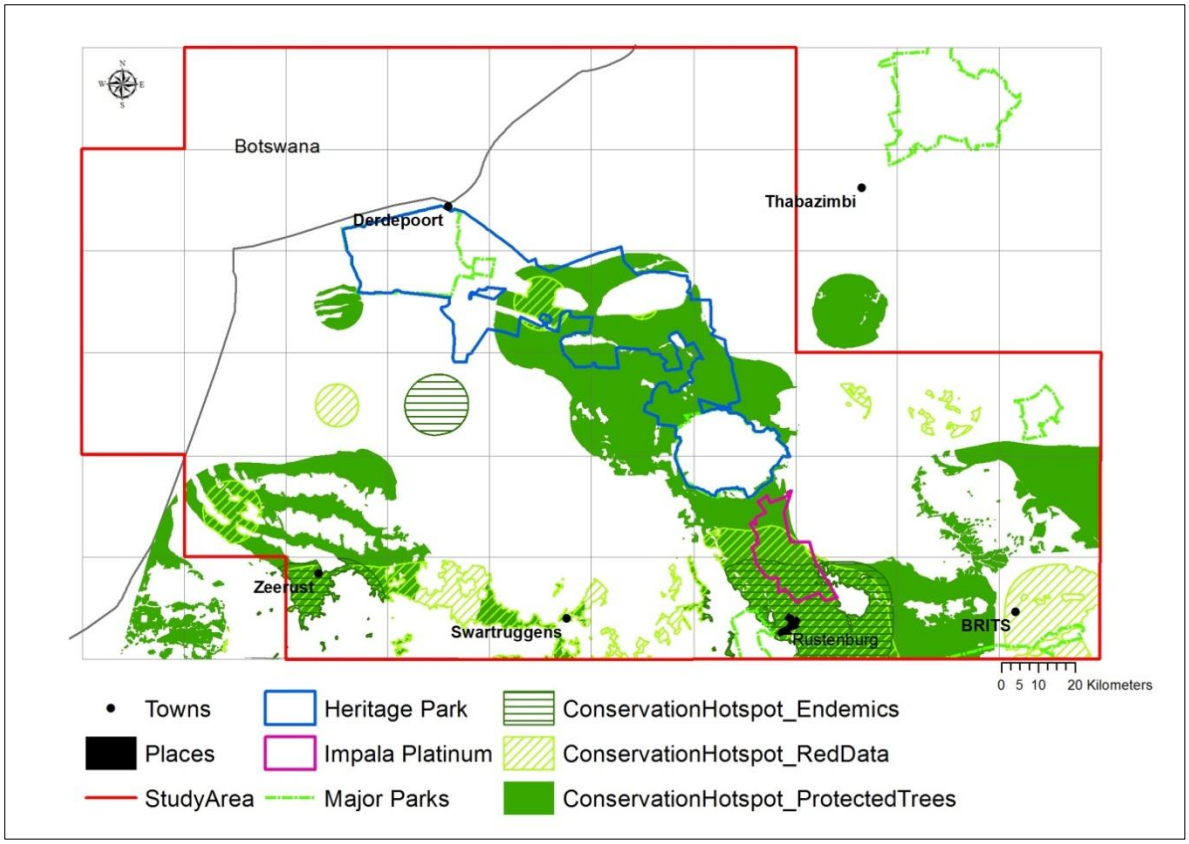

Figure 7.2: Conservation hotspots of threatened species (Endemics, Red Data and Protected Trees) endangered through present and future land-use change.

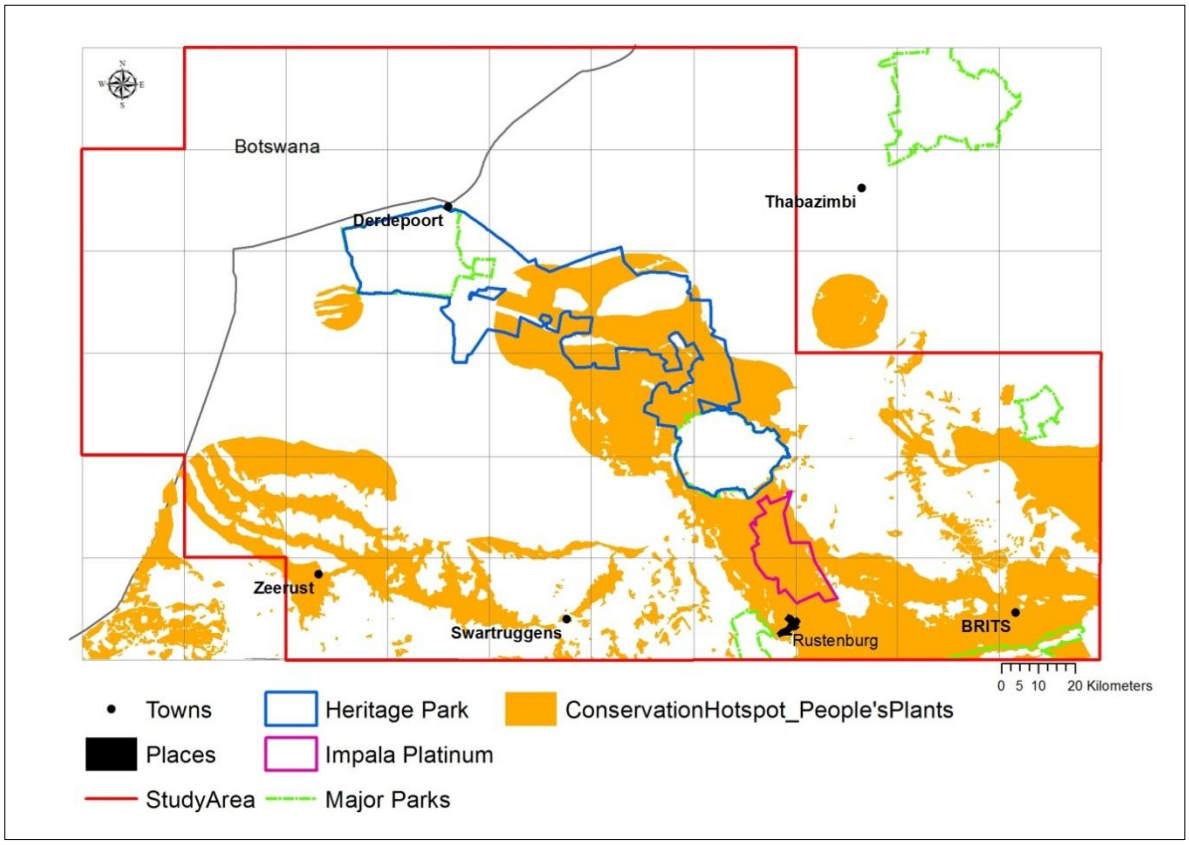

Figure 7.3: Conservation hotspots of useful plants with a great social, cultural and medical value that are threatened through present and future land-use change.

In contrast to the Heritage Park, the land of Impala Platinum is located within a zone of highest conservation priority, because it ranks among one of the species richest areas in the WCB and holds significant numbers of threatened and useful plant species (figure 7.2), which are greatly endangered by present land use patterns in this area (see chapter 7.3). Impala Platinum is found on a gradient of increasing species diversity and conservation importance (figure 7.1). The mining area covers two conservation hotspots with different conservation status. With 43% to 52% of the recorded plant diversity, the northern part of Impala Platinum can be classified as of secondary conservation importance compared to the southern part. The south of Impala constitutes the species richest area, where 53% to 69% of the WCB phyto-diversity is contained. It directly borders on the highest ranking conservation hotspot in the WCB, the area of the Magaliesberg Protected Natural Environment which harbours a remarkable number of plant species (70%–100% phyto-diversity).

7.2 Conservation importance of the Heritage Park

The extension area of the Heritage Park has been identified as an important floristic link between the existing protected areas Madikwe Game Reserve (MGR) and Pilanesberg National Park (PNP). Additional sampling of plant vouchers (Appendix C) and subsequent analysis of plant taxa richness in the study area has shown that the proposed Heritage Park harbours an important portion of the regional flora.

Table 7.1: The plant taxa richness of the Heritage Park compared to the phyto-diversity of the North-West Province (NW), the western Central Bushveld (WCB) and the Flora of Southern Africa (FSA) region.

Plant Taxa	Heritage Park	% FSA[1]	% WCB	% NW[2]
Infraspecific	1,143	5%	48%	47%
Species	1,065	5%	47%	46%
Genus	468	18%	56%	53%
Family	121	33%	59%	59%

Source of figures: [1] SANBI (2009) and [2]POSA (2010)

The Heritage Park flora comprises about 50% of the plant taxa recorded for the WCB flora and the North-West Province (table 7.1). The bulk of this known diversity is concentrated in PNP and the extension area of the proposed conservation area; more specifically, the predicted taxa richness identifies the eastern Heritage Park as a plant diversity hotspot extension from Rustenburg (e.g. figure 5.39c-d; chapter 5). The higher taxa richness in the proposed conservation area can be attributed to the heterogeneous relief structure of the

parallel hills and lowlands of the Dwarsberg and Gatkop mountain ranges, compared to the plains of the surrounding environments (figure 5.52; chapter 5).

In the same way, the Heritage Park flora exemplifies a significant portion of the plant genera (18%) and families (33%) present in the FSA region (table 7.1). This is also reflected in the pattern of dominant plant genera and families in the Heritage Park (figure 5.7 and 5.8; chapter 5), which show a high congruence to those of the superordinate study area (figure 5.5 and 5.6; chapter 5). Therefore, the planned conservation initiative would preserve an important percentage of the native flora in the North-West Province (46% of the species, 53% of the genus and 59% of the family diversity).

Additionally, the proposed Heritage Park seems to be a hotspot for Protected Tree species (e.g. *Combretum imberbe* and *Sclerocarya birrea* subsp. *caffra*); and useful plants (e.g. *Harpagophytum zeyheri* subsp. *zeyheri*) (figure 5.44a and 5.45a; chapter 5). The unstandardized species richness map also show a notably higher richness of Red Data plants than outside of the planned reserve (figure 5.43a; chapter 5). Especially the species *Acacia erioloba* and *Boophone disticha* are said to be rapidly declining in Southern Africa and have been found to be still prevalent species in the Heritage Park.

Table 7.2: The number and percentage of floristically important plant taxa found in the Heritage Park compared to the western Central Bushveld.

Important Plant Taxa	WCB	Heritage Park	% WCB
Endemics	21	7	33%
Red Data	43	15	35%
Problem Plants	246	142	58%
Useful Plants	367	235	64%
Bush encroachment Indicators	58	39	67%
Protected Trees	10	7	70%

As illustrated in table 7.2, the Heritage Park flora harbours 70% of the Protected Tree, 64% of the useful plant, 35% of the Red Data and 33% of the endemic plant species native to the WCB flora. As a result, the extension of MGR and PNP into a larger protected area would contribute significantly to biodiversity conservation in the western part of the Central Bushveld Bioregion.

It is not only the general high plant taxa richness that warrants a conservation initiative, but also the locally alarming signs of vegetation change in the extension area. Approximately 10% of the Heritage Park flora was identified as consisting of problem plants, which

constitute 58% of the problem plants recorded for the western Central Bushveld (table 7.2). Disturbed areas are often invested with exotic weed species such as *Lantana rugosa* and *Opuntia ficus-indica*, but also with invader plants, for instance *Melia azedarach* and *Ipomoea purpurea* (table 7.3). Furthermore, 67% of the bush encroachment indicators occurring in the study area could be recognized in the Heritage Park. The most prevalent indicators found include in descending order: *Grewia flava*, *Asparagus suaveolens*, *Acacia tortilis*, *Diospyros lycioides* and *Dichrostachys cineria*. The extensive upsurge of problem plants and bush encroachment in the proposed park can be related to veld degradation caused by land-use change.

Table 7.3: Declared weed and invader species in the Heritage Park quarter degree grids according to the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (Henderson, 2001).

Species	Status	Category	QDGs
Lantana rugosa	Weed	1	13
Melia azedarach	Invader	3	8
Opuntia ficus-indica	Weed	1	7
Argemone ochroleuca subsp. *ochroleuca*	Weed	1	4
Datura ferox	Weed	1	4
Cereus jamacaru	Weed	1	3
Xanthium strumarium	Weed	1	3
Arundo donax	Weed	1	2
Cuscuta campestris	Weed	1	2
Datura stramonium	Weed	1	2
Ipomoea purpurea	Invader	3	2
Lantana camara	Weed	1	2
Opuntia stricta	Weed	1	2
Ricinus communis var. *communis*	Invader	2	2
Sesbania punicea	Weed	1	2
Solanum sisymbriifolium	Weed	1	2
Xanthium spinosum	Weed	1	2
Araujia sericifera	Weed	1	1
Cirsium vulgare	Weed	1	1
Jacaranda mimosifolia	Invader	3	1
Nicotiana glauca	Weed	1	1
Opuntia aurantiaca	Weed	1	1
Opuntia humifusa	Weed	1	1
Opuntia robusta	Weed	1	1
Solanum mauritianum	Weed	1	1
Solanum seaforthianum var. *disjunctum*	Weed	1	1
Tipuana tipu	Invader	3	1
Tithonia rotundifolia	Weed	1	1

Major threats to the plant diversity in the proposed conservation area were identified to stem from crop cultivation in the western extension area towards MGR, as well as subsistence farming and residential settlements in the east (figure 5.55; chapter 5). Residential areas were

found to have the highest mean plant species richness in the Heritage Park ($\bar{x}$ = 403) followed by cultivated land ($\bar{x}$ = 378) and farmland ($\bar{x}$ = 314) (table 5.27; chapter 5).

However, the greatest species diversity is still documented for vacant land (max = 1,063) in the Heritage Park which is not under conservation yet (table 5.27; chapter 5). Furthermore, the analyses have shown that the formal conservation areas do not preserve enough of the spatial range of phyto-diversity ($\bar{x}$ = 257). As a result, the extension area is highly complementary to the existing protected areas, and thus will contribute significantly to the protection of phyto-diversity in the region.

7.3 Conservation importance of the Impala Bafokeng Mining Complex

The Impala Bafokeng Complex is located within the major plant diversity hotspot of the WCB as illustrated by the plant taxa interpolation maps (figure 5.38 to 5.47; chapter 5). Present and predicted taxa richness identifies the mining area as both a hotspot for plant species richness and rare plants. Current plant inventories indicate particular high species richness for the southern part of the Impala study area.

These findings could be correlated with the heterogeneous terrain morphology in the Rustenburg district (figure 5.52; chapter 5). First of all, plant diversity is associated with the hills and lowlands ($\bar{x}$ = 444) and associated undulating plains ($\bar{x}$ = 404) (table 5.18; chapter 5). The norite koppies situated in the south-east of Impala Platinum were found to be extraordinary species rich compared to the rest of the mining area. In his vegetation study Lamprecht (2010) documented the same number of species for the noritic outcrops as for the thornveld, although they make up only a small portion of the mining grounds. The noritic outcrops form an important part of the threatened Norite Koppies Bushveld, a vegetation type that is endemic to the south-eastern WCB (Lamprecht et al., 2011).

Table 7.4: The plant taxa richness of the Impala Platinum in context of higher level floras in which the study area is located: the *Flora of Southern Africa* (FSA), the western Central Bushveld (WCB) and the North-West (NW) Province.

Plant Taxa	Impala Platinum	% FSA[1]	% WCB	% NW[2]
Infraspecific	1,410	6%	60%	58%
Species	1,347	6%	60%	58%
Genus	609	23%	73%	70%
Family	171	46%	84%	84%

Source of figures: [1] SANBI (2009) and [2] POSA (2010)

The present study could affirm that the renowned Impala Platinum Complex provides habitat for a significant fraction of the regional and bioregional flora (table 7.4). Statistical calculations revealed that 60% of the WCB infraspecific species and species diversity is found in the quarter degree grids of the mining area.

The qualification of the mining lease area as a plant diversity hotspot is also reinforced by looking at the genus and family levels (table 7.4). Even though the study area makes up only less than 1% of the FSA region, it harbours 23% of its genera and 46% of its family diversity. More outstanding, the Impala lease area contains 73% of the genus and 84% of the family diversity in the WCB.

Table 7.5: The number and percentage of floristically important plant taxa found in the Impala Platinum mining area compared to the western Central Bushveld (WCB).

Important Plant Taxa	WCB	Impala Platinum	% WCB
Endemics	21	5	24%
Red data	43	19	44%
Problem Plants	246	152	62%
Bush encroachment Indicators	58	38	66%
Protected Trees	10	7	70%
Useful Plants	367	261	71%

A large share of this diversity is once again characterized by useful plants and Protected Tree species with 71% and 70% respectively (table 7.5). Meaningful is also the comparatively high diversity of rare plants in the Impala study area, where 19 Red Data and 5 endemic species are distinguished, making up 44% and 24% of those reported for the WCB. The most prevalent Red Data species found were in order: *Frithia pulchra* (Rare), *Myrothamnus flabellifolius* (Data Deficient), *Aloe peglerae* (Endangered) and *Boophone disticha* (Declining). Among these, *Frithia pulchra* and *Aloe peglerae* are important endemic species that are restricted in their occurrence to the Goldreef Mountain Bushveld, which is widespread on the rocky hills and ridges in the study area. The Central Bushveld endemic *Erythrophysa transvaalensis* was found to be a common species as well.

However, the rich plant diversity in the Impala Bafokeng Complex is threatened by mining, residential expansion and crop cultivation (figure 5.55; chapter 5). Mining ($\bar{x}$ = 421) and associated industrial development ($\bar{x}$ = 540) have been identified as the major pressure on plant species richness; in addition, high species counts have been recognized for residential areas (max = 1,045) and cultivated land (max = 1,061) (table 5.27; chapter 5). The same applies to endemic and Red Data species in the mining area (table 5.29 and 5.31; chapter 5).

Conversely, Protected Tree species are mainly imperilled by residential areas ($\bar{x}$ = 3.4), and secondly by mining and industrial development ($\bar{x}$ = 3.3) (table 5.33; chapter).

Industrial activities in the mining area were also approved to be a major hotspot for the invasion of problem plants ($\bar{x}$ = 74) and bush encroachment indicators ($\bar{x}$ = 22) (table 5.35 and 5.37; chapter 5). Simultaneously, high numbers of problem plants (max = 121) and bush encroachment indicators (max = 30) were counted for the vacant land, which indicates that a significant invasion of weeds, invaders plants and bush encroachers into the natural areas of the Impala Bafokeng Complex has occurred.

7.4 Summary

Hotspot analysis identified several important priority areas for conservation in the western Central Bushveld (WCB). These incorporate both high plant species richness and high present and future threat of vegetation transformation. Species hotspots have been found to be mainly concentrated in areas of intensive human use, predominantly in areas with high pressures of urban, industrial and agricultural developments. This is especially true for the area around Zeerust, Rustenburg and Brits where agriculturally arable soils overlay industrially important resources of chromite, fluorite and platinum-group metals. Quarrying of limestone, slate and granite pose a local threat to plant diversity as well.

Phyto-diversity conservation hotspots have been found to correspond quite well with those of endemic and Red Data species. However, priority areas for the conservation of Protected Tree species as well as useful and medicinal plants have to be demarcated separately.

For example, the Heritage Park has been identified as a conservation hotspot for Protected Trees and plant species of social, cultural and medical value. At the same time the proposed Heritage Park would contribute an important part to phyto-diversity conservation in the WCB as it harbours about 50% of the bioregions plant diversity as well as 35% and 33% of the Red Data and endemic plant species.

Thus, Heritage Park can be seen as a plant diversity hotspot extension from Rustenburg as suggested by the modelled species richness maps. The comparatively high species richness in contrast to the surrounding bushveld plains can be attributed to the diverse habitats of the parallel hills and lowlands in the park. However, phyto-diversity in the Heritage Park is

endangered by the invasion of problem plants, bush encroachment and crop cultivation for commercial and subsistence farming.

As opposed to the Heritage Park, the main threat to plant diversity at the Impala Bafokeng Mining Complex stems from the mining of platinum-group metals from the Rustenburg Layered Suite. Industrial activities have also increased the pressure of problem plant invasion and bush encroachment on the local phyto-diversity.

Impala Platinum rank among the prime conservation hotspots in the WCB, as it is found on a gradient of increasing species diversity and conservation importance, where 43% to 69% of the recorded plant diversity is found. Furthermore, 44% and 24% of the Red Data and endemic species have been documented in the mining area respectively. The high diversity of plants and rare species can be attributed to the unique topographical, geological and soil characteristics of the Bushveld Complex. For example, the noritic outcrops, which represent an important part of the threatened Norite Koppies Bushveld, have been identified as particularly species rich. Several endemic and Red Data species are associated with the norite koppies.