

The mystery of the silver vegetation

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ABOVE LEFT: About ten woody species are responsible for the stands of silver-grey vegetation at Kalkheuveld near Broederstroom. The most characteristic tree in these communities is the silver pipe stem tree *Vitex zeyheri* (the large trees framing the picture on the left and right and the tall tree near the centre), a species with a very limited geographical range.

RIGHT: The blue-currant *Rhus zeyheri* is a shrub with attractive blue-grey leaves. Despite its decorative foliage, the species is rarely seen in cultivation.

Photos: Braam van Wyk.

At the interface of the Grassland and Bushveld biomes, one suddenly comes across a rare plant community in the northern parts of the Cradle of Humankind World Heritage Site where most of the species have a grey or silvery foliage.

So often we are in such a hurry to get from point A to point B within the shortest time and at the greatest velocity possible, that we rush past the most obvious and interesting natural wonders. Especially in grassland areas, which are often dismissed as being an unexciting biome by the ill informed. We invite you to stop and have a better look at the superb silver vegetation near Broederstroom in the North West Province, close to Pelindaba. You will notice an abrupt change in the colour of the foliage when travelling southwards from Broederstroom on the R512, just past Lesedi Cultural Village. Nowhere else along that route is this silver colour of the plants more pronounced than in the area known as Kalkheuveld, which lies in the northern part of the Cradle of Humankind World Heritage Site. The species composition within this grassland is as unusual as the general colour of its patches of woody vegetation and yet it has never been formally described.

This area has a unique biogeographical setting in that it happens to be in an ecotone. Ecotones are the narrow transitional zones between two different vegetation types or biomes. Evolutionary pressure on plants growing in such zones is very high, since they have to adapt to both of the biomes. In this case, the ecotone is between two biomes, bushveld to the north and grassland to the south. Here the peculiar silver-leaved plant communities exist within a more monotonous grassland. The geology of the area is also unusual in that it is composed of dolomitic limestone, whereas the majority of South African grasslands occur on igneous substrates or non-dolomitic sedimentary rocks.

Geology

Edaphic (soil) factors play a crucial role in the life of all plants. Plants can undergo special adaptations, and it is usually adaptations to the soil or the climate as these two aspects are the most important factors beyond the plant's control. Geology can thus be seen as an operational force in the process of natural selection. All species, however proficient in their ability to exist within certain climatic conditions, are just not able to survive on certain substrates.

The geology of the Kalkheuvel area is unique. Kalkheuvel, as its name suggests, is on dolomite: a rock type mainly composed of calcium and magnesium carbonate. However, the dolomite here is unusual in the sense that it contains large quantities of iron and possibly manganese as well.

The combination of these elements gives the dolomite a chocolate brown colour - something not often seen on the Highveld.

In addition to this, stromatolites of different sizes, ghastly sinkholes and small globular stones, shiny in appearance and somewhat heavy for their size, can be found. X-ray diffraction of the latter shows that it consists of 79% goethite and 21% quartz. Goethite is an iron oxide hydroxide that gives a yellow-orange colour on the broken-off surface of the stones.

Stromatolites are concentric layered features in the dolomite and represent the fossilized remains of cyanobacterial colonies that lived in a shallow sea around 2 500 million years ago. It is believed that the photosynthetic activities of these microscopic organisms were partly responsible for the deposition of the dolomite.

Vegetation

According to vegetation classifications, this area can be categorized as 'Rocky Highveld Grassland' also known as Bankenveld (the name of the Botanical Society Branch in the area). The key environmental factors that help to maintain this area as grassland are frost during the winter and a healthy fire regime to avoid the devastating effects of bush encroachment.

From observation and fieldwork, it can be concluded that the area is essentially a grassland, but contains interesting patches of silver-leaved plant communities. The silver-grey colour is due to the foliage of several woody species creating a mosaic of dense woody stands within

a predominantly herbaceous grassland matrix.

Flora

The silver-leaved vegetation communities are composed mainly of currant resin-tree *Ozoroa sphaerocarpa*, resin-tree *O. paniculosa* var. *paniculosa*, silver pipe stem tree *Vitex zeyheri*, corkbush *Mundulea sericea*, blue guarri *Euclea crispa*, common sugarbush *Protea caffra*, silver sugarbush *P. roupelliae*, blue-currant *Rhus zeyheri*, highveld cab-

bage-tree *Cussonia paniculata* subsp. *sinuata* and Waterberg cabbage-tree *C. transvaalensis*.

The silver pipe stem tree *Vitex zeyheri* is rather rare. It is one of the most uncommonly found trees on the Highveld and in the adjacent Bushveld Biome and it is not known what factors determine its natural distribution. The corkbush *Mundulea sericea*, on the other hand, is a common tree, usually occurring in bushveld savanna regions



LEFT: A member of the Fabaceae (pea family) *Melolobium subspicatum* is easily overlooked because of its small yellow flowers and greyish green, compound leaves, each with three narrow leaflets.

BELOW: The silver pipe stem tree *Vitex zeyheri* is easily identified by palmately compound, silvery-grey leaves borne in opposite pairs. The flowers appear in spring and are small, not very conspicuous and borne in clusters. The irregular shape of the flower betrays its modern classification as a member of the Lamiaceae (sage family) and until recently the genus was usually placed in the closely related Verbenaceae. The fruit is a small capsule, at maturity surrounded by a persistent, cup-shaped calyx. Photos: Braam van Wyk.

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ABOVE: An old silver pipe stem tree *Vitex zeyheri* has an upright habit and a thick corky bark, the latter providing excellent protection against the frequent wildfires that occur naturally in late winter and early spring.

RIGHT: *Melolobium subspicatum*, a Red Data species, is only known from a few localities in dolomitic grassland. This typical re-sprouter flowers profusely following wildfires in spring. Photos: Braam van Wyk.



What is even more fascinating about the Kalkheuveld region is that the silvery appearance of the plants is not only restricted to the woody members growing there, but is also seen in many of the herbaceous plants.

and is the larval host plant for several butterfly species. Its leaves are grey-green with silvery, silky hairs. Some degree of confusion exists as to which species of *Ozoroa* occur in the area. Evidence suggests that both *O. sphaerocarpa* and *O. paniculosa* var. *paniculosa* do and the two species are so similar that they are easily confused. Although the two taxa are usually mutually exclusive in their habitat, they definitely co-occur here. However, what we have taken as *O. sphaerocarpa*, some botanists would prefer to call *O. paniculosa* var. *salicina* (narrow leaf resin-tree).

The distinction, if any, between these

two trees remains to be resolved. *Rhus zeyheri*, *Euclea crispa*, the *Protea* and the *Cussonia* species all have grey or bluish-green leaves, which enhances this atypical colour of the veld.

What is even more fascinating about the Kalkheuveld region is that the silvery appearance of the plants is not only restricted to the woody members growing there, but is also seen in many of the herbaceous plants. Most of the perennial herbs are conspicuously more silvery and hairy than their pure grassland counterparts a short distance south.

Plants that are normally silvery in appearance (like *Pearsonia sessilifolia*)

are even more strikingly so on the dolomites.

The Red Data species, *Lotononis adpressa* subsp. *leptantha* with its hairy grey foliage can be seen almost anywhere and large colonies of the endangered *Melolobium subspicatum* occur within the grassland.

Not only is this area home to the special silver vegetation, but also other interesting plants can be observed in the region during the right time of the year. These include the relatively rare *Harveya pumila*, *Launaea rarifolia*, *Jatropha hirsuta* var. *oblongifolia* and the orchid *Holothrix randii* amongst others. Some of these plants are unusual

in that their recorded natural distribution does not coincide with this area.

Why the silvery colour?

It is still uncertain what factors play a role in the congregation of the different plants to form these distinctly silver-grey plant communities. It is thought that specific geological and soil factors might be the cause, since they occur mainly on the silica- and ferricrete-rich Diepkloof Formation.

One hypothesis is that these specific plants are able to accumulate the heavy metals found in the soils and that is why they grow very well on such an unforgiving substrate. Another possibility is that one or a few of these plants may accumulate these substances and

then exert some kind of physiological effect on the neighbouring vegetation giving the plants associated with them a competitive advantage over the rest of the vegetation in the area and perhaps even creating a micro-environment where other plants are not able to grow.

This is very conspicuous in several species and large colonies of plants, such as *Melolobium subspicatum* can be seen being split up very effectively by the woody vegetation. Conversely, four species of *Commelina* are found amongst the woody vegetation, but are completely absent from the grassland.

Many other examples exist and such plant behaviour conforms to the hypothesis that there is some physical barrier

that keeps some plants in and others out of these silver communities.

Perhaps the answer lies in the possible presence of mycorrhiza (fungal elements in the soil that grow in association with the roots of a plant) within the earthy sphere where the unseen plant roots seem to have a life of their own, completely detached from the orderly aerial plant organs.

Whatever the reason for this phenomenon, Kalkhevel and its surroundings is a very special place and one could argue that no other site like it exists on the earth. It deserves to be fully protected to ensure the survival of a very unusual ecosystem as well as for the appreciation and enjoyment of present and future generations. ♾

RIGHT: Although the flush of new leaves are often bright green in the currant resin-tree *Ozoroa sphaerocarpa*, they become increasingly dull and grey with age.

BELOW: One of the easiest species to recognize from a distance in stands of silver vegetation is the highveld cabbage-tree *Cussonia paniculata*, a sparsely branched tree, each stem ending in a rounded head of large, palmately compound leaves. *C. transvaalensis* is rather similar, but it tends to be more branched and the leaves are bi-palmately compound. Photos: Braam van Wyk.



BELOW: Forbs (dwarf woody shrubs in grasslands) with silvery and often hairy foliage are common in grassland associated with the patches of silver-grey woody vegetation. This is probably the first published photograph of *Lotononis adpressa* subsp *leptantha*, a rare plant only known from western Gauteng and the bordering Kalkhevel area in the North West Province. Photo: Braam van Wyk.



Further reading

- Low, A.B. and Rebelo, A.G. (eds) *Vegetation of South Africa, Lesotho and Swaziland*. Department of Environmental Affairs and Tourism, Pretoria.
Cairncross, B. 2004. *Field guide to rocks and minerals of southern Africa*. Struik, Cape Town.
Van Wyk, B. and Van Wyk, P. 1997. *Field guide to trees of southern Africa*. Struik, Cape Town.
Van Wyk, B. and Malan, S.J. 1998. *Field guide to the wild flowers of the Highveld*. Struik, Cape Town.