An Ecological Perspective of the Moepel Conservancy

The creation of the Moepel Conservancy on the northern part of the Waterberg plateau is a visionary project that, when fully realised, will conserve a critical, valuable remnant of the mountain bushveld.

The huge biodiversity of the area is the consequence of several important ecological factors which together determine its floral and faunal potential – and feasible land use.

The most important ecological parameters are summarised as follows:

- **Topographic Features** (***see Figure 1***). These comprise the latitude of the area, the changes in altitude, the incisions made by rivers and the predominant slope (aspect) of the land.
    - **Latitude:** the Conservancy lies mostly between 23^0 45'and 24^0 South; it is therefore entirely south of the Tropic of Capricorn (23^0 26' South currently). This means that the sun is never directly overhead, even in mid-summer – and that south-facing slopes only receive oblique sunlight in summer and possibly no sunlight in winter, especially in deep river valleys. They are therefore cooler and moister than the sun-facing northern slopes.
    - **Altitude:** the Conservancy slopes generally from the south towards the north. The highest point within the Conservancy is at 1453m in the south-east; further south the ground rises to 1461m near Noord Brabant. The lowest point is about 850m on the lower Tambotiespruit in the north-west.
    - **Rivers:** Two major rivers, the Tambotie and the Klip, drain the Conservancy towards the north-west and north respectively. The eastern boundary of the reserve is marked by the north-flowing Goud river (which runs into the Lephalala) and in the south, the Poer-se-Loop drains westwards into the Mokolo. These rivers have resulted in highly dissected terrain, so that although the overall slope is towards the north-west, there are many areas of high ground in the middle of the Conservancy, with numerous steep and south-facing slopes.

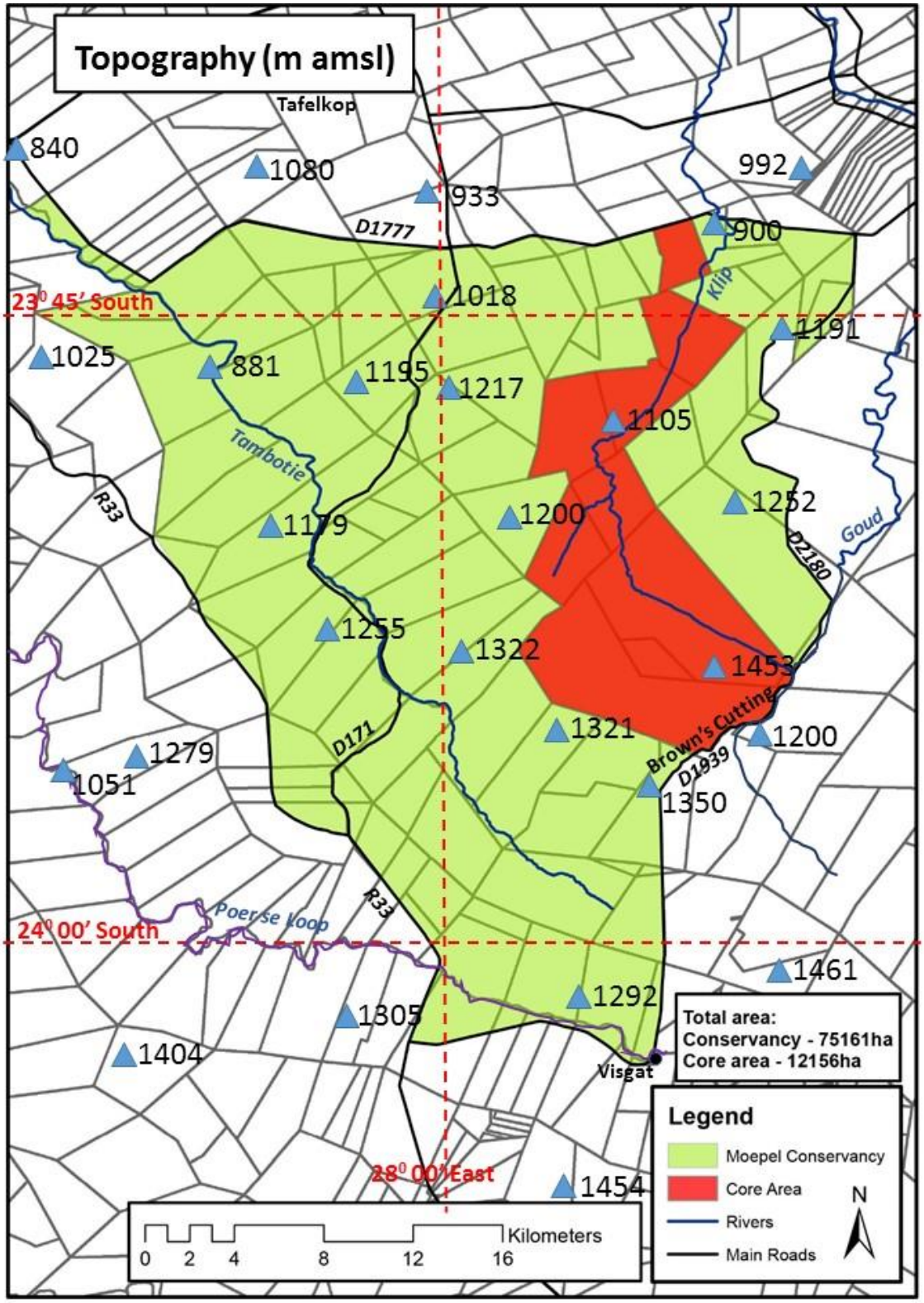

Figure 1: Selected Spot Height Elevations across the Moepel Conservancy

- **Geology** (***see Figure 2***).The underlying geology is the most important single determinant, because it is responsible for the soils that can be present in the area. This part of the Waterberg is underlain almost entirely by sandy sedimentary rocks of the Waterberg Group, a sequence laid down by rivers flowing from the north and north-east between 1 600 and 1900 million years ago. The rocks are present in layers, as in a cake, with the oldest layers at the bottom and the youngest at the top.
    - In this area, the oldest, lowest Waterberg sediments, called the **Makabeng Formation**, occur as coarse conglomerates and sandstones along the northern boundary of the Conservancy, south of the road D1777 between the Beauty (D171) and Brown's Cutting D2180/1939) roads ***(Figure 3A)***.
    - Overlying them towards the south are the reddish-brown sandstones and conglomerate bands of the **Mogalakwena Formation**. These sandstones contain deep reddish-purple horizons, the colour caused by the rusting of iron grains. They represent the oldest such "red-beds" in the world and are evidence of the first presence of oxygen in the atmosphere ***(Figure 3B).***
    - Above them (near the top of Brown's Cutting and close to where the Beauty Road joins the R33) are finer-grained sandstones of the **Cleremont Formation *(Figure 3C)***; and
    - on the highest ground, in the south of the Conservancy near Visgat, one can see the very fine-grained grey sandstones and siltstones of the **Vaalwater Formation**. This youngest member of the Waterberg Group may have been laid down in a lake environment – or even in a shallow sea - whereas all the older sediments were deposited by rivers ***(Figure 3D)***.
    - In the north-eastern corner of the Conservancy, a post-Waterberg diabase dyke has intruded into the Makabeng sandstones, creating a localised area of sweetveld.
    - Just on the north-western edge of the Conservancy, on the north side of the D1777 district road to Lephalale, outliers (*inselberge*) of much younger Karoo sediments occur as a result of major faulting along an E-W axis. The most prominent of these outliers is Tafelkop. These sediments produce more fertile, clay-rich soils than those of the Waterberg Group and this, combined with the lower altitude and greater proximity to the Tropic of Capricorn result in a distinctive change in vegetation type (see below).

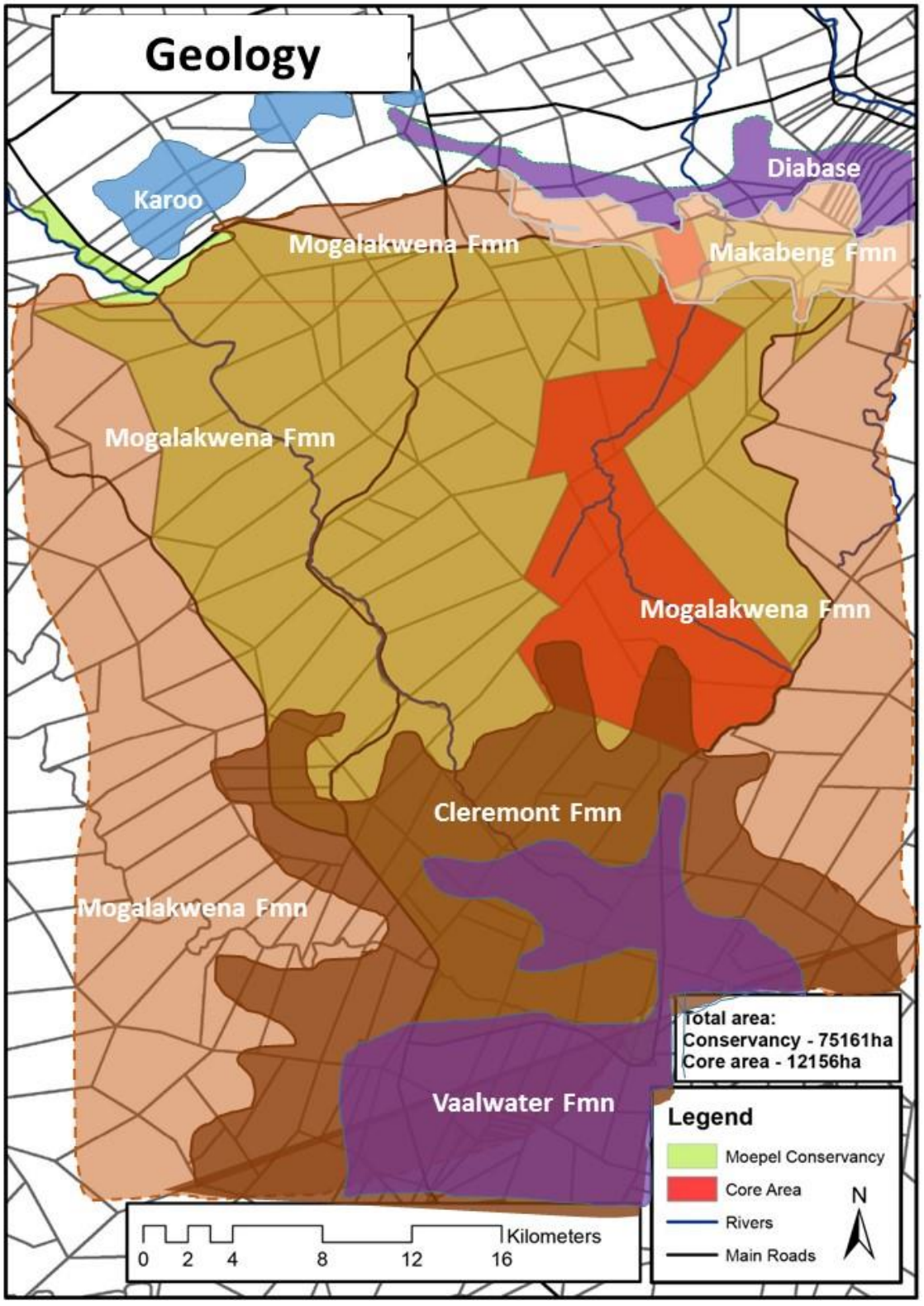

Figure 2: Simplified Geology of Waterberg Group sediments on the Moepel Conservancy *(from published mapping)*

Figure 3. Examples of Waterberg sediments: A (above left) – Makabeng conglomerates; B (above right) – Mogalakwena sandstones; C (below left) – Cleremont sandstones; D (below right) – Vaalwater siltstones

- **Rainfall and Groundwater.** This northern part of the Waterberg plateau receives an average of 400-600 mm per annum, usually concentrated in mid-summer. Although some residents consider this to be a low rainfall area, it is in fact about the average for the country as a whole. The problem is that most of the rainfall runs off – hence four large rivers in the area – and very little is retained as groundwater, other than in a few places where there are large deep fractures that behave like aquifers. The reason for this poor groundwater retention is that the sandstone rocks are very ‘tight’: there is little opportunity for water to be stored within sandstone or shale layers, so fractures offer the only limited storage capacity. After rainfall, most of the water soon seeps out of layers and fractures in the rocks and into rivers. Throughout the Waterberg, apart from the area underlain by the siltstones of the Vaalwater Formation, groundwater tends to be mildly to significantly acidic (ph of 4.5-6.5). In the Vaalwater-Dorset-Visgat-Bulgerivier area, which is underlain by Vaalwater Formation rocks, the ph rises to neutral or even slightly alkaline (ph 7.0-7.5). Similarly, in those few areas where the rocks are not sandstones, but younger intrusive dark rocks (diabases or dolerites), the ph can be mildly alkaline. Within the Conservancy, the only area where this

applies is in the extreme north-east, on and around the farm Hanover, where a post-Waterberg diabase dyke has intruded into the sediments (Figure 2).

- **Soils.** The predominantly quartz-rich sandstone sediments that make up the Waterberg break down to form coarse, sandy soils, with a very low (<5%) clay content. When the mainly acidic rain and groundwater percolates through these soils, it dissolves the contained mineral salts and carries them away in solution – a process called leaching. The result is a coarse, clay-poor soil depleted in mineral nutrients and unable to retain moisture. This is called a ***dystrophic*** soil and is especially infertile. By far the majority of soils across the Waterberg are of this type. In the few areas where there is local development of a clay-rich shaley soil, or a soil formed from an intrusive diabase/dolerite, the result is quite different: the soil has a high clay content, water passing through it becomes alkaline and does not dissolve minerals. The clay retains moisture and the minerals are available as nutrients for plant life. Such soils are called ***eutrophic***. Dystrophic soils typically support poor, low-nutrient, narrow-leaved grassland known as ***sourveld***, whereas eutrophic soils support nourishing, broad-leaved grasses known as ***sweetveld.*** Eutrophic soils occur mainly north of the D1777 district road, as described above.

- **Vegetation Controls.** It should be no surprise that latitude, altitude, topography, aspect and soil types determine the plant species that can grow or thrive on a particular terrain. The infertile, dystrophic soils of the Waterberg plateau do not enable any one species to thrive: all species struggle to grow and do so very slowly. Because no one or two species are able to become dominant, opportunities are created for a great number of species to attempt to survive. The result, as with the fynbos flora of the southern Cape, is very great floral biodiversity. Moreover, the same factors allow invasive and alien species too to establish themselves more readily than in an area where there are a few dominant species. One of the worst of these is *bankrotbos* (or *slangbos*), *Seriphium plumosum*, a fynbos species indigenous to the Cape, but which has gradually migrated northwards, exploiting overgrazed pastures and old cultivated lands. Many parts of the Waterberg plateau have been invaded by *bankrotbos*, at the expense of scarce grassland.

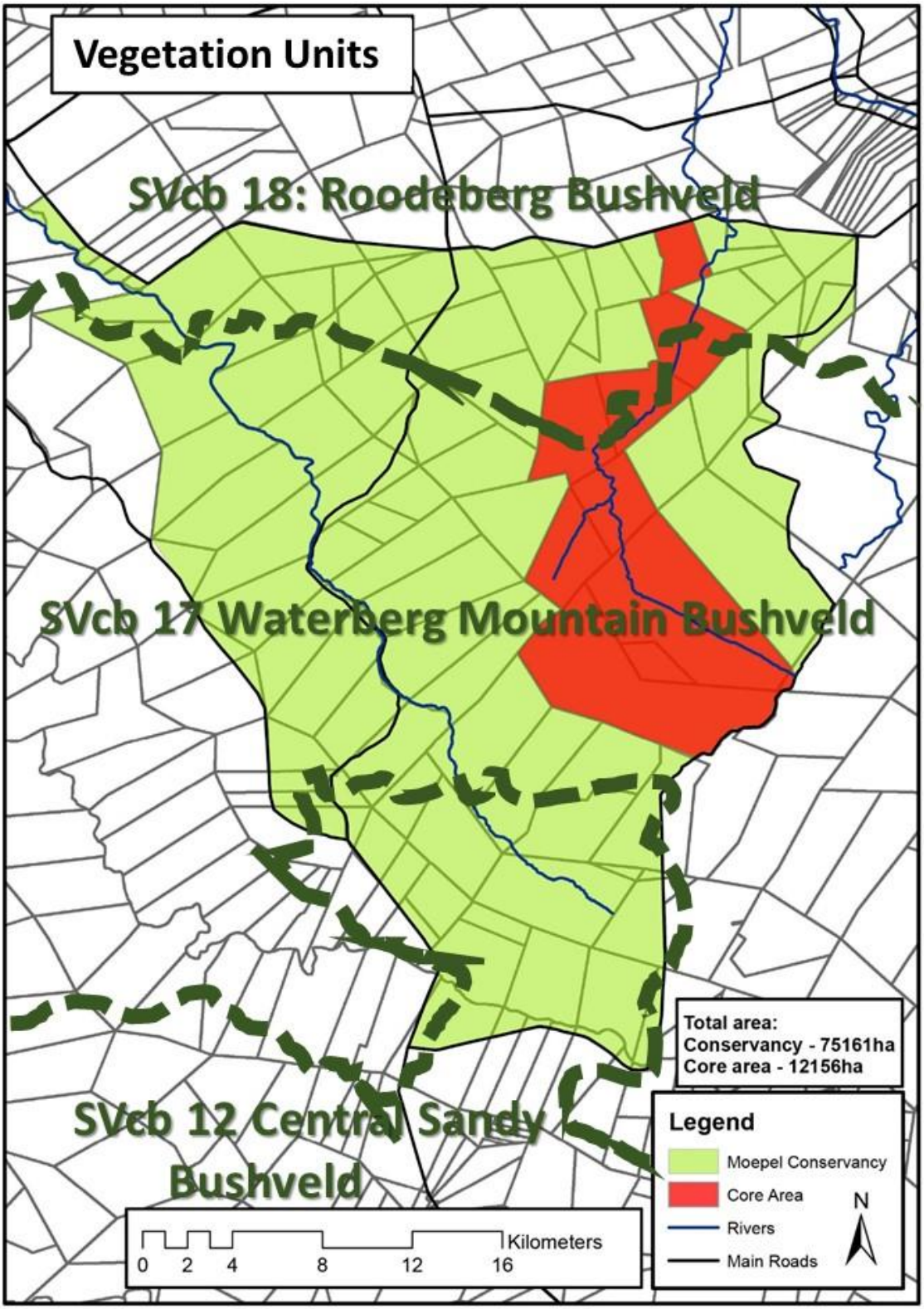

Figure 4: Major vegetation units occurring on Moepel Conservancy
(from Mucina & Rutherford, 2007)

- **Vegetation Types.** Three vegetation types have been identified across the Moepel Conservancy area, as shown in ***Figure 4***. These are described, from south to north, as follows:

    - **SVcb12 – Central Sandy Bushveld:** closely associated with the silty soils of the Vaalwater and Cleremont Formations, the characteristic vegetation comprises *Burkea africana* (wild syringa) and *Terminalia sericea* (*vaalbos*) woodland, with subordinate *Combretum* spp. (bushwillow), as well as *Acacia*, *Ziziphus, Rhus* (now *Searsia*) and *Euclea* species. This is the least infertile part of the Waterberg sourveld and soil depth is generally greater than further north. Although dominated by poor grasses like *Eragrostis* and *Aristida* species, although highly palatable species such as *Themeda triandra* (red grass) and *Panicum maximum* (guinea grass) also occur. However, it also supports *Dichepetalum cymosum*, or *gifblaar* (poison-leaf), an extremely toxic low-growing plant that comes into leaf in early summer and can be fatal to domestic stock and wildebeest. (It resembles other sandveld plants like the sand apple, which is not toxic.)
    - **SVcb17 – Waterberg Mountain Bushveld:** this is characteristic of the rugged, dissected, mountainous central portion of the Conservancy – and of much of the plateau. It is associated with the coarse sandstones and conglomerates of the Mogalakwena Formation. Typical vegetation includes *Faurea saligna* (boekenhout), *Protea caffra* (*suikerbos*), *Mimusops zeyhri* (***moepel*** / Transvaal milkwood) and *Diplorhynchus condylocarpon* (hornpod), grading into *Burkea-Terminalia* woodland with minor *Acacia*. Below an altitude of about 1300 m amsl, *Sclerocarya birrea* (marula) can be seen. Another common tree, but only of the warmer north-facing slopes, is *Albizia tanganyicensis* (paperbark false-thorn), with its unmistakeable creamy-white papery bark. Shrubs include *Englerophytum magalismontanum* (*stamvrug*) and *Xerophyta retinervis* (*bobbejaanstert*), on rocky, thin-soil areas. Grasses in this unit (e.g. *Aristida*, *Eragrostis* sp.) are generally not very palatable.
    - **SVcb18 – Roodeberg Bushveld:** limited to the northern foothills of the Waterberg plateau and the flatter ground beyond, the type is dominated by various Acacia species, notably those not found further south, e.g. *Acacia nigrescens* (knob thorn / *knoppiesdoring*). Other characteristic trees of this lower, warmer, more fertile ground include *Combretum imberbe* (leadwood / *hardekool*), *Kirkia acuminata* (mountain seringa) and *Spirostachys africana* (*tambotie*). In areas below 1000m amsl, baobab, *Adansonia digitata*, also occurs naturally. The veld is generally sweeter and grasses more palatable, although rainfall is less than on the higher ground to the south. Historical overgrazing (a common feature of sweetveld) has led to widespread encroachment of *Dichrostachys cinerea* (sickle bush / *sekelbos*), especially visible along the disturbed road verges.

Naturally, these three vegetation types are summaries of the three major vegetation domains within the Conservancy; there are transitions between each of them and pockets of one type within another. They are the result of all the ecological factors listed above. As a whole, the Waterberg plateau supports an enormous diversity of plant species: several hundred trees and large shrubs and thousands of small shrubs, flowering plants, ferns, mosses etc.

- **Fire.** Fire is a natural phenomenon in the savanna; throughout time, the area has been periodically burnt by fires, caused mainly from lightning strikes in spring and early summer. Fire is important for several reasons:
    - It burns off moribund (dead, rotten) vegetation, which, whilst acting as a mulch and protection for roots against the sun, also hosts parasites and moulds and can inhibit new growth. An accumulation of dead vegetation also builds up a fuel load that can make a fore hotter and harder to control;
    - It prevents bush encroachment by burning off young saplings and bushes, thereby preserving areas of open grassland;
    - Fire stimulates some plant species to germinate and/or to flower.

  Normally, therefore, controlled regular (periodic) burning should be an integral part of a bush management plan. However, where an area has been divided up into small fenced properties, within which there are animals that cannot escape and other assets that are vulnerable to being destroyed – and whose owners are often not resident on the properties – uncontrolled fires can prove catastrophic. Although firebreaks are required by law, the fact is that no firebreak can stop a fierce fire from jumping across to unburned veld on the other side; breaks are really no more than mandatory access roads that enable fire-fighters to move in and control a fire when necessary. The advantage of a large conservancy, in which internal fences have been removed, is that it becomes possible to implement a carefully controlled burning programme. Such programmes are carried out routinely on large properties like Lapalala and Welgevonden, for example.

- **Aliens and Invasives**. There are many alien and /or invasive plants that take advantage of the challenging floral environment of the sourveld to establish toeholds. *Bankrotbos* has already been mentioned. Other major alien/invasive threats on the Waterberg plateau include *Cereus jamacaru* (queen of the night / *nagblom*); *Melia azedarach* (syringa, Cape lilac, *maksering)*; *Campuloclinium macrocephalum* (Pom pom weed / *Pom pom-bossie*): *Lantana camera* (lantana); *Opuntia* sp (cactus family / prickly pear/*turksvy*); *Eucalyptus* species (blue gums / *bloukomme*); *Lopholaena coriifolia* (fluff bush / *pluisbos*); *Populus* species (poplar / *populier*); and alien *Acacia* species like wattles and mimosas. All members of a formal conservancy should be

required to commit to the elimination of such species on their properties, especially along water-courses.

Summary. The remarkable floral diversity of the Waterberg plateau, taken together with its latitudinal location and highly varied terrain, has created, inevitably, an equally diverse population of fauna: over 120 mammalian species; over 100 reptiles; over 400 bird species; around 600 butterflies, moths and dragonflies; and thousands of insect species.

This diversity alone makes it not only rewarding but also essential for substantial parts of the plateau to be placed under the responsible stewardship of conservation-minded landowners who at the same time have a pragmatic, sustainable approach to caring for the land and to being able to afford doing so.

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Key Sources

1: 250 000 series topocadastral and geological maps of Sheets 2326 (Ellisras/Lephalale); 2328 (Pietersburg/Polokwane); 2426 (Thabazimbi); and 2428 (Nylstroom/Modimolle).

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