



## Factsheet #9



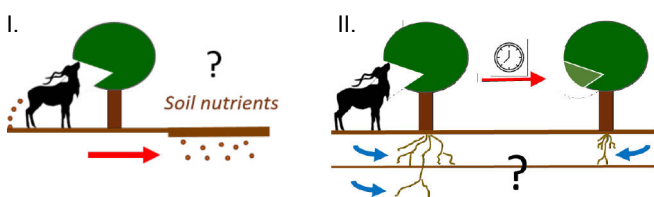
# Effects of wildlife on soil and vegetation

## Background

Animals that mostly feed on plants can in turn modify soil resource availability for plants<sup>1,2,3</sup>. The effects of wildlife, however, on plant communities and vegetation structure may depend on which plant resource they modify and how strongly they modify it. It may also depend on the nutrient uptake of the plants following defoliation. Root activity might change because regrowth of leaves requires a substantial allocation of reserves from roots to shoots.

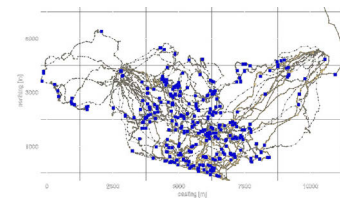
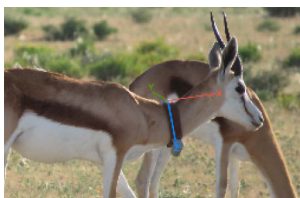
Here we assessed the effects of

- I. natural wildlife activity on soil nutrients and
- II. experimental defoliation on root water uptake of Mopane

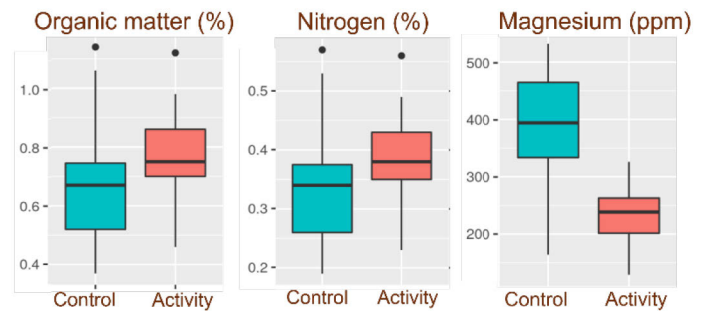


## Soil nutrients

Soil samples of 0–40 cm soil depth were collected during the rainy season in April 2021 in the private protected area “Etosha Heights”. We randomly selected 20 activity centres of springbok, namely resting and feeding sites and 20 non-activity (= control) sites. Sites were determined using GPS localization data of 12 collared springboks (Fig. 1). All sites had similar soil composition (% sand, clay, loam).



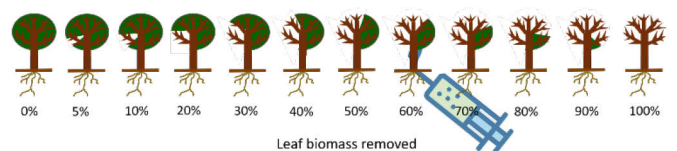
**Figure 1:** GPS-collared springbok and example map of its movement paths (in grey) and calculated activity sites (in blue).



**Figure 2:** Amount of selected soil nutrients at different sites of antelope activity

- Organic matter and macronutrients like nitrogen, phosphate, and potassium were higher in soils of activity sites than of control sites (Fig. 2, of macronutrients only nitrogen shown).
- Micronutrients like magnesium were lower in soils of activity sites than of control sites (Fig. 2). Micronutrients were, however, very high at all sites.

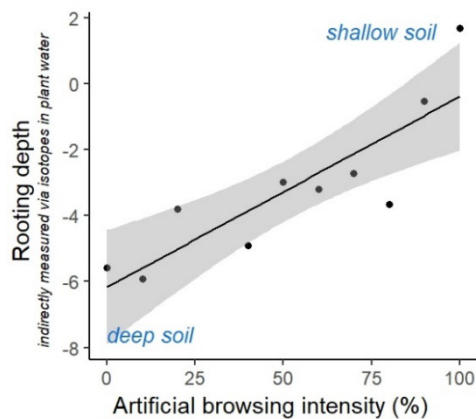
## Root activity



In the beginning of two consecutive rainy seasons, we artificially removed leaf biomass of 12 Mopane trees (*Colophospermum mopane*) each at a different intensity.

After 3 months of leaf regrowth, we sampled stem water and measured the abundance of natural stable isotopes therein (<sup>18</sup>O). It helps us to deduce the depth of water uptake. The abundance of oxygen-18 in soil water is usually low in deep soil and high in shallow soil<sup>4</sup>.

Browsing has stimulated relatively more water uptake from shallow than from deeper soil layers (Fig. 3 and 4).



**Figure 3:** Effect of browsing intensity on rooting depth of Mopane trees. Rooting depth was indirectly estimated from the relative abundance of natural  $^{18}\text{O}$  isotope in uptaken water of the trees. Trees had 3 month time for regrowth after last browsing event.



**Figure 4:** Our experimental site from a birds eyes view.

## Key messages

- Wildlife can improve landscape water regime, since organic matter increases the water holding capacity of soils, hence decreasing the negative impacts of droughts.
- Wildlife can ameliorate growth conditions for perennial grasses, since – compared to shrubs – grasses grow mostly nitrogen-limited and less limited by micronutrients.
- Mopane seems to compensate browsing disturbance of leaves at the cost of deep root growth: → less active fine roots in deep, reliable wet soil layers.
- Trees may therefore be more prone to drought stress and browsing wildlife might thus weaken the competitive power of Mopane against grasses. It may facilitate grassy patches across the landscape.
- Caution must be taken in terms of balancing the benefits of wildlife and increasing of the number of wildlife. In any case, overstocking must be avoided. High numbers will lead to degradation of both, soil (e.g., soil compaction) and vegetation (e.g., loss of vegetation).

## References

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Photo: Katja Geißler

## The ORYCS Project

The German-Namibian research project “ORYCS – Options for sustainable land use adaptations in savanna systems” aims to assess the suitability of wildlife management strategies in Namibia as options for adapting land use to climate change in savanna ecosystems.

[www.orycs.org](http://www.orycs.org)

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