

Nutrient Dynamics: Linking herbivory and plant functional traits

The savanna biome covers approximately 20% of the terrestrial land surface area and 50% of the African continent, supporting a large number of people who are socially and economically disadvantaged. Ecological transformation and degradation, driven by global and land-use changes threaten the resilience and integrity of this system. As such, an understanding of the factors which mediate ecosystem structure and function are integral in predicting how the vegetation and plant-soil system will respond to the inevitable perturbation. Large herbivores are the second biggest consumer of biomass in Savannas after fire and together with nutrient resource availability (which is herbivore-mediated) have significant effects on the way that nutrients are cycled and how the system functions holistically. Consequently, this impacts the overall health and fitness of the plants within the system. Herbivores directly and indirectly influence nutrient turnover and availability, primarily by increasing the rate at which biomass reaches the decomposition phase, returning nutrients in a form which is far more readily mineralised. Furthermore, herbivores consume physiologically active plant tissue (e.g. un-senesced leaves), mediating the transfer of a greater quantity of nutrients from this living tissue to the soil. Nutrient heterogeneity is greatly impacted by the mobility of herbivores, resulting in some areas that are resource rich and others that are resource poor. The interaction between the quantity of available nutrients and herbivory may either be positive (increase) or negative (decrease) depending on a variety of variables-such as climate, vegetation type etc. Our aim in this research is to quantify the effects of herbivory by large ungulates on the relative availability of major nutrient ions in the soil and on plant functional traits, thereby gaining an understanding of how herbivory impacts tree health. The site of this research is Marakele Park bordering the Marakele National Park in Limpopo. Here a boma (unutilised for ~10 years) serves as the herbivore exclusion site with both Umbrella thorn (*Vachellia tortilis*) and Russet bushwillow (*Combretum heroense*) trees selected in each site. The initial phase of fieldwork took place in October 2013 where tree selection was made. There are striking differences between the sites, with larger trees and higher herbaceous biomass within the boma than outside (Figure 1). The relative effects of herbivores has yet to be quantified but given the differences between the two sites we expect to obtain a greater understanding of the effects of herbivores on savanna systems, both in terms of ecosystem-level nutrient cycling and tree nutritive health.

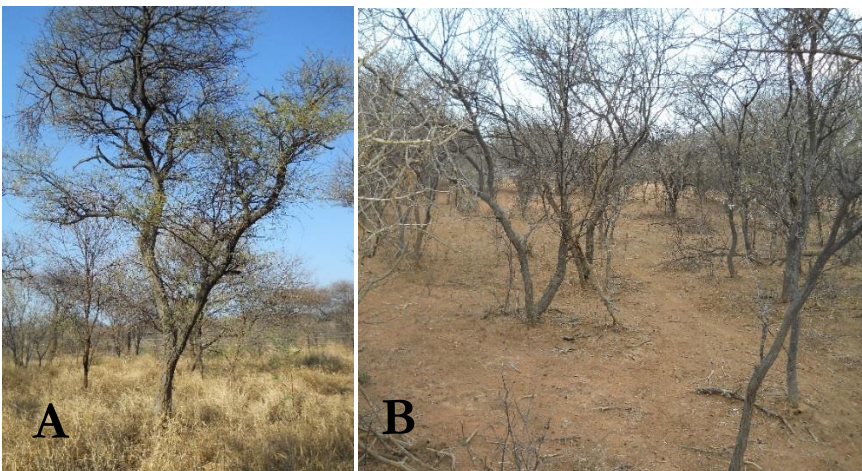


Figure 1: Umbrella thorn (*Vachellia tortilis*) trees and their surrounding habitat within a herbivore exclusion site (A), and adjacent to the enclosure where the trees are exposed to herbivory (B).