# A phylogenetic analysis of the origin and assembly of forbs in South African grassy biomes using DNA

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The grassy vegetation of southern Africa, comprising savannas and grassland biomes, is characterized by high diversity of non-grassy herbaceous plants including forbs and geoxyles, and cover approximately one third of the region's land surface area. However, this vegetation is endangered due to human pressure and large-scale agriculture pressure such that more than 40% of the vegetation is already irreversibly modified and the remaining highly threatened. Consequently, grasslands have been assigned as a high priority conservation action with an urgent need for management strategies to mitigate further loss of species. Frequent fires and herbivores limit tree growth and maintain biodiversity in these grassy biomes. Therefore to survive many grassland forbs and shrubs have underground storage organs allowing them to resprout rapidly after fires. This growth form is extremely resistant to frequent grass fires but decline in the absence of fire but the relative importance of local ecology and large-scale historical processes causing such differences remains poorly understood.

Here, we focused on forbs, one of the life forms adapted to fire maintained grassy biomes, to investigate their assembly pattern and evolutionary history. Specifically, we will use a time calibrated phylogenetic tree (derived from DNA barcoding data) to test the hypothesis that the evolution of the species rich grassy biomes follows the ecological expansion of flammable C4 grasses. Furthermore we will investigate the significance of fire adaptations as a selective advantage for forb diversification to date the timing of the appearance of fire-adapted lineages. The outputs will include DNA barcodes generated for taxa occurring in herbaceous layer of grassy biomes, contributions to major initiatives and databases globally and nationally, dated molecular phylogeny, capacity building and several high impact scientific publications.