

Elephant-mediated cascading effects of water point closure in Kruger National Park

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The high density of African elephants in Kruger National Park (KNP), South Africa, is a concern for management because of their destructive effect on the vegetation. Construction or removal of artificial water points has been suggested to influence the densities and distribution of elephants and hence their effects on the vegetation. In this study we examined the long-term effects of different scenarios of water point closure in KNP on the spatial distribution of elephants and calculated the effects on the vegetation and other herbivores. Using a dynamic ecosystem model, SAVANNA, several scenarios were evaluated that varied in (1) decreases in availability and spatial arrangement of artificial WPs according to current and future policies, (2) different levels of natural water availability to investigate the effects of wet and dry years, and (3) different densities of elephants. Our results showed that elephants indirectly negatively affected the distributions of mesomixed feeders, mesobrowsers and some mesograzers under very wet and intermediately wet scenarios. Furthermore, the closure of water points only had an impact on the ecosystem during drought years, resulting in increased densities of all herbivores, except for giraffe and steenbok, in areas close to rivers. The spatial distributions of elephant bulls and breeding herds were less affected by the closure of water points than most of the other herbivore species. The future closure of almost half of the water points to allow vegetation and animal distribution patterns to recover and to increase heterogeneity is expected to have little effect.