

Stability , recovery and resilience in piosphere systems in the Kruger National Park

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Introduction The study aimed to resurvey herbivore utilisation gradients around artificial waterholes (piospheres) described in an earlier study (Thrash 1993) against a backdrop of waterhole closure and biodiversity management in the Kruger National Park (KNP) , to contribute to an understanding of factors governing recovery and resilience in protected areas . Key issues addressed include the response of the plant community and soil parameters to a relaxation of herbivore utilisation pressure at closed waterholes and changes in the same parameters at sites which have remained open . These ecosystem properties were considered in relation to structural and functional ecosystem thresholds (Briske et al . 2006)

Materials and methods Belt transects were laid out at eleven waterholes in the KNP . Transects extended from the waterhole to 5 km from the waterhole , and within that , herbaceous basal cover and species composition were sampled along four parallel transects , using a nearest-plant method . Compressed vegetation height , infiltration and soil compaction were similarly sampled . Soil samples taken at intervals along the distance-from-water gradients were analysed for total nitrogen and phosphorus , organic matter , pH and soil texture .

Results and discussion Basal cover increased significantly ($p \leq 0.05$) from 1990 to 2006 at all study sites and in all piosphere zones . There were no significant differences in basal cover between open and closed sites . Changes in basal cover were most closely related to high relative annual rainfall in 2006 compared to 1990 . Herbaceous species composition changed significantly ($p \leq 0.05$) from 1990 to 2006 , but with no significant differences in the amount of change between open and closed sites . No general piosphere patterns emerged in 2006 , in contrast to 1990 . Soil analyses (N , P , pH , organic matter , texture) and field measurements (infiltration , compaction) revealed no systematic piosphere patterns , although large increases in infiltration between 1990 and 2006 occurred , independently of waterhole closure . Herbaceous basal cover and compositional changes indicated that the system had crossed a structural threshold , but the lack of significant soil patterns points to this being reversible , as no functional thresholds were approached . Piosphere recovery appears driven largely by climatic factors rather than waterhole closure *per se* , within the time period under examination .

Conclusions Waterhole closure does not contribute significantly to recovery rates in piospheres in the KNP—this appears largely driven by variation in climatic factors . However , changes to the herbaceous composition/basal cover do indicate that a structural ecosystem threshold has been crossed , and ongoing monitoring is required to assess the likelihood of functional thresholds being crossed in the future .

References

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