

Using remotely sensed imagery to monitor savanna rangeland deterioration through woody plant proliferation: a case study from communal and biodiversity conservation rangeland sites in Mokopane, South Africa

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ABSTRACT

Healthy rangelands are of economic and biodiversity conservation importance in the savannas of northern South Africa. The proliferation of woody plant species on the rangelands, known as bush encroachment, constitutes a degradation of rangeland quality, given the nonpalatability of the encroaching species. Though the causes are not fully understood, heavy grazing and fire suppression are thought to be primary causes of bush encroachment. This study utilised multitemporal (1994, 2000 and 2008) SPOT images of two rangeland sites in Mokopane, South Africa in monitoring and assessing bush encroachment. The study sites were a fenced biodiversity conservation rangeland with game species in which fire is suppressed and an open access communal rangeland grazed by livestock. Field plot-derived encroachment categories of heavy encroachment, moderate encroachment, low encroachment and non-encroached were used in hybrid classification of the images, following radiometric normalisation and geometric registration. GIS overlay analysis using the non-encroached category enabled the quantification and mapping of change in the preferable open grass rangeland typifying savannas. The biodiversity conservation area was undergoing a trend of reduction in open grass rangeland, whereas the communal rangelands were getting more opened up by livestock trampling. Rangeland management practices of fire utilisation, stocking levels and stock concentration account for the differing trends. Lightly grazed and heavily grazed wild game-utilised rangelands under a fire suppression rangeland management regime had bush encroachment rates of approximately 34% and 56%, respectively, in 6 years. Multitemporal remote sensing proved to be useful for monitoring bush encroachment as indicator of state of savanna rangelands.