Research Briefing Note

A leakiness index for assessing landscape function using remote sensing.

Ludwig, J., Eager, R., Bastin, G., Chewings, V. & Liedloff, A. (2002) *Landscape Ecology. 17: 157-171*

Indicators of landscape function: comparing patchiness metrics using remotely-sensed data from rangelands.

Bastin, G., Ludwig, J., Eager, R., Chewings, V. & Liedloff, A. (2002) *Ecological Indicators 1: 247-260*

BACKGROUND

Landscape function describes the potential of country to retain and use rain water and soil nutrients as resources for vegetation growth. Functional landscapes have a good cover of evenly dispersed perennial vegetation patches that trap and effectively utilise rain water. There is little overland flow and, therefore, little loss of nutrients in water-borne sediment. These patches also reduce loss of nutrients in wind-borne dust in dry times. Conversely, dysfunctional landscapes have lost much of their patch cover and leak water and nutrients.

AIM

1. To develop a leakiness index based on high resolution remote sensing (e.g. aerial videography) that will rank the functionality of grazed landscapes. This will allow us to monitor landscapes at a broader scale than is currently possible with ground-based techniques.

2. To compare the performance of the leakiness index against other published landscape metrics that appear to have similar predictive capability.

OUTCOMES

- We developed two indices; the Directional Leakiness Index (DLI) for use where the direction of surface flow in a remotely-sensed image is known, and a Multi-Directional Leakiness Index (MDLI) where the direction of overland flow is less certain. These indices are based on the spatial arrangement of vegetation patches in suitably classified imagery.
- Both DLI and MDLI positioned savanna sites on a continuum of landscape functionality that agreed well with ground-based assessment.
- In a separate test, the leakiness indices (DLI and MDLI) ranked both savanna and arid rangeland sites according to rated functionality more consistently than weighted mean patch size and a proximity index. Results of the lacunarity index were comparable with the leakiness indices.
- Software to calculate leakiness index values is available from the authors.

IMPLICATIONS

Because these leakiness indices are based on high resolution remote sensing, the functionality of rangelands can now be monitored over larger areas than is currently possible with ground-based methods. In the future, we aim to apply these indices using very high resolution satellite imagery (e.g. 4m multispectral Ikonos). We also suggest that use of the leakiness index be linked to regional-scale assessment of grazing impact using established remote-sensing based methods (e.g. grazing gradient analysis, land cover change analysis).

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