Grazing gradient detection with airborne imaging spectroscopy on a semi-arid rangeland

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Abstract

A grazing gradient in Grand Staircase-Escalante National Monument, UT was identified with field measurements and spectral mixture analysis (SMA) of remotely sensed hyperspectral imagery. Grazing gradient persistence during a period of above-average rainfall was confirmed with multi-temporal Landsat imagery. SMA yielded accurate sub-pixel fractional cover measurements of photosynthetic vegetation (PV), non-photosynthetic vegetation (NPV) and bare soil, and revealed a clear trend of increasing PV and NPV and decreasing bare soil with distance from water. The effect of topographic slope on cover fractions with distance from water was investigated and indicated that cover fraction values are tightly coupled to slope and distance from water. Results showed that on steeper slopes, fractional cover of PV and bare soil increased while NPV decreased. The fundamental relationship of changing cover fractions with distance from water was preserved within all slope classes. This work shows how imaging spectroscopy can be used to assess rangeland condition by demonstrating its ability to detect fine scale variations in cover fractions known to be sensitive to grazing. The study indicates the potential for routine assessment of rangeland resources with current and future spaceborne hyperspectral imaging systems.

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