

Soil surface indicators of desertification from the northern Chihuahuan Desert and the Great Basin

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Introduction

For cost-effective evaluation of landscape condition it is inevitable that remotely sensed satellite or aerial imagery will become the norm for data acquisition. However, due to the limitations of current remote sensing technology, many key properties cannot be measured directly. Ideally, more easily measured surrogate indicators could be used. Litter cover is an important indicator of several ecological functions (NRC 1994), but is difficult to detect remotely. It has been suggested that plant canopy cover, which is relatively easy to detect, may serve as an effective surrogate. We tested the hypothesis that plant canopy cover is positively related to litter cover in the northern Chihuahuan Desert, and in three areas of the Great Basin.

Methods

We measured canopy and litter cover in ungrazed exclosures and adjacent grazed pastures at three locations in the Chihuahuan Desert near Las Cruces, New Mexico, five locations near Burns, Oregon, seven locations near Milford, Utah, and six near Idaho Falls, Idaho. The Oregon, Utah, and Idaho locations are in the Great Basin.

Plant canopy and litter cover were quantified using a continuous line intercept method (de Soyza *et al.* 1998). Canopy cover was measured on five to ten 100 m lines, and litter cover was measured both under and between canopies on two to three randomly selected 10 m segments of each transect.

Results and discussion

Simple linear regressions for sites in the Chihuahuan Desert yielded a significant negative relationship between percent vegetation cover and percent litter cover where litter decreased

with increasing cover by vegetation (New Mexico; Fig. 1). No significant relationships were found for sites in the Great Basin (Oregon, Utah, Idaho; Fig. 1). In particular, similar vegetation cover occurred with considerably different amounts of litter at sites in Oregon and Idaho in the Great Basin.

Overall, we found that vegetation cover is not a good surrogate for estimating litter cover. Although contrary to our expectation of a positive relationship between percent vegetation cover and percent litter cover, the strong negative relationship between these cover components for the Chihuahuan Desert sites appears to suggest that remotely sensed vegetation cover may be used as a surrogate to predict litter cover. However, a more detailed analysis of the Chihuahuan Desert sites showed that the three ungrazed sites with low litter cover had mostly grass while the three grazed sites with high litter cover had mostly shrubs (mesquite). Thus the negative relationship between vegetation cover and litter cover at these sites was probably due to the relatively greater production or longevity of litter in shrub dominated sites. Grazing did not produce a similar effect on the vegetational composition of sites in the Great Basin. Refinements that take into account vegetation species composition may improve the ability to predict litter cover from vegetation data.

References

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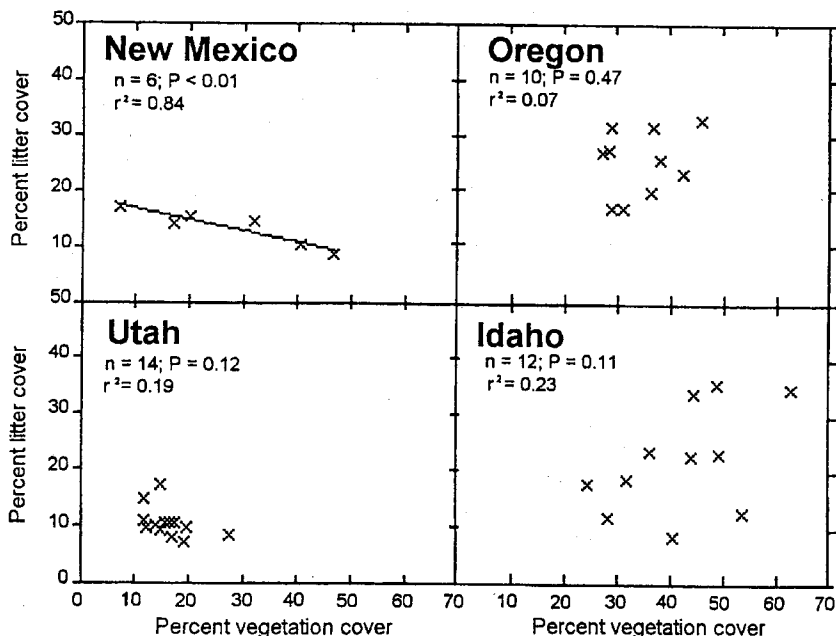


Fig. 1. Relationships between percent litter cover and percent vegetation cover for sites in the Chihuahuan Desert (New Mexico) and sites in the Great Basin (Oregon, Utah and Idaho)