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## Monitoring grassland and dynamics in Mongolia

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**Key words :** vegetation cover, species richness, piosphere, transect, Mongolia

**Introduction** Grasslands comprise 80% of Mongolia's 1.56 km<sup>2</sup> territory and provide forage resources for the dominant rural pastoral livelihood. Recent change from a collective management system to private livestock ownership has shifted local land use patterns and increased concern about overgrazing with reports identifying over 70% of the land as degraded or desertified (UNEP 2002). Degradation in this arid and semi-arid plateau is a regional problem as northern China experiences expanding desertification due to biophysical causes and human activities such as inappropriate livestock management (Li et al. 2006). As attention focuses on land cover change understanding steppe rangeland conditions and determining sustainable pasture management requires knowledge of current vegetation dynamics. This paper looks at piosphere vegetation density and species richness in the steppe and desert-steppe region of Mongolia. Water points reflect the interaction between pastoralists, livestock, and the environment and can identify land use patterns and potential degradation from overgrazing.

**Methods** Changes in vegetation coverage are an indicator of degradation (Huang and Siegert 2006). This study investigated 110 piosphere sites in Ovorhangai and Omnogov provinces in central and southern Mongolia using the line-transect method along a 1 km gradient to identify vegetation coverage and species richness around water points used by livestock. Multiple measurements were taken at 25, 50, 100, 200, 500, and 1000 meters and plant samples were collected at each site. SPOT-4 satellite imagery with 1 km resolution was used to detect vegetation cover. NDVI values were then calculated for April through October, 1998-2006 at each site. These were correlated with field data to establish present and historical perspectives of land cover in the provinces.

**Results and discussion** Results established low vegetation coverage and similar levels of species richness in the two regions. Both sites showed declining vegetation density as distance increased from water points with lowest plant coverage recorded at 500m and 1000m in sites. Average vegetation coverage at the 55 Ovorhangai sites was 13% at 25m and decreased to 7.8% at 1000m ( $r^2=0.78$ ) whereas Omnogov showed lower density, declining from 4% at 25m to 2% at 1000m ( $r^2=0.86$ ). Species richness was variable, not showing strong correlation to vegetation density or to NDVI land cover values. *Artemisia* was most common in both sites, followed by *Allium*, *Chenopodium*, and *Bassia* in Ovorhangai and *Potentilla*, *Caragana*, and *Iris* in Omnogov. NDVI correlated with field data and reflected a decrease in land cover over 9 years. Values fluctuated within years, particularly in the higher precipitation months of July, August, and September (Ovorhangai—25%; Omnogov—42%).

This study identifies limited pasture resources in the steppe and desert steppe zones that cover approximately half of Mongolia. Unlike the common pattern of sacrifice zones and intensified usage near piospheres identified in other dryland regions (Adler et al. 2001) this highlights the role of abiotic factors, such as precipitation and edaphic conditions, in area vegetation coverage and suggests that overgrazing, often cited as a cause of local degradation and desertification, has less impact on piospheres in Mongolia than other arid and semi-arid regions. Millennia of low density pasture usage by Mongolia's traditional mobile herders points to pastoralism as an effective management approach in an area with limited vegetation resources (Fernandez-Gimenez 2001). Local and regional debate can focus on the importance of variable environmental conditions rather than solely the role of livestock in piosphere decline. Relevant management policies and development strategies, including targeted UNCCD goals and international assistance programs, can be appropriately designed to address humans within the environmental parameters in Mongolia's steppe and desert steppe grasslands.

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