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Habitat Classification Using Landsat 7ETM+ Imagery of the Ikh Nart Nature Reserve and Surrounding Areas in Dornogobi and Dundgobi Aimags, Mongolia

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Abstract

Wildlife studies increasingly employ thematic information, such as habitat classes, extracted from remotely sensed image data. Thematic information allows researchers to characterize biological processes of interest at various spatial scales. In and around Ikh Nart Nature Reserve of Mongolia, few large-scale habitat and landscape maps exist. Such maps are needed to support several long-term biological studies. Here we report the results of a maximum likelihood supervised classification of a five-band multispectral composite Landsat 7ETM+ image of the Dalanjargalan Soum section of the reserve and surrounding areas in Dornogobi and Dundgobi Aimags. We classified the image into seven habitat classes: dense rock, low-density shrub, high-density shrub-rock mix, semi-shrub steppe, forb-dominated short grass steppe, tall vegetation, and ephemeral standing water bodies. Overall classification accuracy was 90.5% with a K_{hat} statistic of 88.8%, and a user's accuracy of >85% per class, suggesting strong agreement between map and ground reference information. As such, the map presents a detailed distribution of habitats that may be suitable for a variety of research applications including the analysis of wildlife ranging behavior and the identification of priority areas for conservation.

Key words: Ikh Nart Nature Reserve, Landsat, map, Mongolia, supervised classification, habitat, wildlife

Introduction

Studies that describe biological processes at the local, regional, and global scale increasingly employ thematic information extracted from remotely sensed satellite image data of the earth (Sampson & Delgiudice, 2006). Information from satellite imagery has been applied to diverse contexts, from the quantification of landscape change (Lunetta *et al.*, 2006) to the assessment of alternative energy viability (Dudhani *et al.*, 2006). In particular, habitat information from satellite imagery has been applied to a variety of wildlife studies (Hansen *et al.*, 2001; Braun, 2005; Newton Cross, 2007; Stevens *et al.,* 2007). Johnson *et al.* (2004), for example, used multispectral Landsat images to map (and predict) suitable habitat for endangered mountain caribou (*Rangifer tarandus caribou*) at multiple scales in British Columbia, Canada. Other studies have used habitat information from satellite imagery to examine patterns of habitat use (Jepsen *et al.*, 2002), monitor variations in species richness (Gould, 2000), and plan protected areas (Smith *et al.*, 1997). As such, habitat classification represents a valuable tool for landscape conservation and research (Johnson *et al.*, 2004).

In Mongolia, satellite imagery has been used to survey the country's ecological landscape in several studies. It has aided in linking seasonal patterns in primary productivity with the migratory patterns of Mongolian gazelles (*Procapra gutturosa*, Leimgruber *et al.* 2001), and also been used to assess Mongolia's vegetation cover (Naidansuren, 2003), and mitigate the growing impact of livestock (Rasmussen *et al.* 1999). Studies have yet to employ high resolution imagery to explore the biogeographical characteristics of the Gobi-steppe ecosystem.

Ikh Nartiin Chuluu Nature Reserve in Dornogobi Aimag (province) sits at the unique confluence of grassland and semi-desert steppe zones of the Gobi-steppe ecosystem (Reading *et al.*, 2006) and is the site of several wildlife studies focusing on ungulates, carnivores, insectivores, and raptors (Reading *et al.,* in press). The reserve

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