Original Article

Creating a Ruggedness Layer for Use in Habitat Suitability Modeling for Ikh Nart Nature Reserve, Mongolia

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Abstract

Spatially-explicit wildlife habitat models are increasingly used to study optimal habitat for species of conservation focus. A ruggedness layer, that summarizes aspect and slope, provides a useful tool for analyses conducted in a Geographic Information System (GIS), such as developing a habitat suitability index model to measure species habitat use. Ruggedness layers prove especially useful in areas where topography represents a key habitat component. We created a ruggedness layer for the Ikh Nart Nature Reserve and surrounding areas in northern Dornogobi Aimag (province), Mongolia. Using a 90 m Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM) and ArcGIS 10 spatial analyst, we created 9 categories for ruggedness. When combined with other thematic layers such as vegetation, the ruggedness layer becomes a powerful tool for analyzing habitat use by individual animals. The results of such analyses may inform decision makers in protected area planning and conservation of endangered species.

Introduction

Spatially-explicit wildlife habitat models are important tools for conservation planning. Models can determine habitat conservation priorities, determine suitability of habitat for reintroduction of endangered species, understand the impact of land management decisions, and identify potential risks to species (Yamada *et al*., 2003). Using a Geographic Information System (GIS), a model can spatially examine the interactions between a species and its environment. Widely used in habitat modeling, a Habitat Suitability Index Model (HSIM) uses an index scale to rate appropriate and inappropriate habitat for a species (Yamada *et al*., 2003).

Topography can represent an important variable in analyzing habitat use. Slope, aspect, deposition of snow and patterns generated, rainfall and watersheds, vegetation growth, and cover from predators depend on the topography of an area (Nellemann & Fry, 1995). Many species that inhabit rugged and mountainous terrain depend on the topography of the landscape to find food and cover from predators. In such areas, ruggedness becomes an important topographic variable. The presence of rocky outcrops, steep cliffs, and rolling hills may characterize the ruggedness of an area. However, such characteristics are difficult to map and measure.

GIS users can generate a ruggedness index using measures of slope and aspect for an area of