Available online at www.sciencedirect.com
SCIENCE DIRECT®
Ecological Modelling 183 (2005) 47–65
ELSEVIER
ECOLOGICAL MODELLING
www.elsevier.com/locate/ecolmodel

Modeling the spatio-temporal dynamics and interactions of households, landscapes, and giant panda habitat

Marc A. Linderman[a,*], Li An[a], Scott Bearer[a], Guangming He[a], Zhiyun Ouyang[b], Jianguo Liu[a]

[a] *Department of Fisheries & Wildlife, Michigan State University, East Lansing, MI 48824, USA*
[b] *Department of Systems Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing, China*

Received 17 November 2003; received in revised form 15 June 2004; accepted 12 July 2004

Abstract

Human modification of land-cover has been a leading cause of floral and faunal species extirpation and loss of local and global biodiversity. As natural areas are impacted, habitat and populations can become fragmented and isolated. This is particularly evident in the mountainous areas of southwestern China that support the remaining populations of giant pandas (*Ailuropoda melanoleuca*). Giant panda populations have been restricted to remnants of habitat from extensive past land use and land-cover change. Households are a basic socio-economic unit that continues to impact the remaining habitat through activities such as fuelwood consumption and new household creation. Therefore, we developed a spatio-temporal model of human activities and their impacts by directly integrating households into the landscape. The integrated model allows us to examine the landscape factors influencing the spatial distribution of household activities and household impacts on habitat. As an example application, we modeled household activities in a giant panda reserve in China and examined the spatio-temporal dynamics of households, the landscape, and their mutual interactions. Human impacts are projected to result in the loss of up to 16% of all existing habitat within the reserve over the next 30 years. In addition, we found that accessibility largely controls the spatial distribution of household activities and considerable changes in management and household activities will be required to maintain the current level of habitat within the reserve.

Keywords: Landscape; Households; Giant panda; Habitat; Model; Human impacts