

# The Ecology and Management of Aquatic-Terrestrial Ecotones (Man and the Biosphere Series)



Article

## Impacts of Changing Forest Management Areas on Forest Landscapes and Habitat Patterns in Northeastern China

Wen Wu <sup>1,2,\*</sup>, Yuehui Li <sup>2</sup>, Yuanman Hu <sup>2</sup>, Chunliang Xiu <sup>1</sup> and Xiaolu Yan <sup>3</sup>

<sup>1</sup> Jangho Architecture College, Northeastern University, Shenyang 110819, China; xiucl@nehu.edu.cn

<sup>2</sup> Key Laboratory of Forest Ecology and Management, Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang 110016, China; liyh@iae.ac.cn (Y.L.); huym@iae.ac.cn (Y.H.)

<sup>3</sup> Center for Studies of Marine Economy and Sustainable Development, Liaoning Normal University, Dalian 116029, China; yanxiaolu163@163.com

\* Correspondence: wuwens80912@163.com; Tel.: +86-024-8365-6215

Received: 21 January 2018; Accepted: 12 April 2018; Published: 17 April 2018



**Abstract:** The management of multi-use forests often drives forest fragmentation, which leads to decreased habitat areas and quality. We explored suitable habitat distributions of cervids to evaluate the conflict between small-scale human management and large-scale habitat conservation in human-disturbed forest landscapes. We estimated the potential habitat of roe deer (*Capreolus pygargus*) and determined the contribution of multiple environmental factors to habitat distribution using the presence of roe deer (N = 106) in a maximum entropy (MaxEnt) model. We simulated changes in the suitable habitat and characteristics of landscape patterns based on three forest management area scenarios. The results showed that the potential suitable habitat for roe deer was located mainly in the east. The variables affecting habitat suitability were similar in different scenarios, and included distance to farmland, settlements, rivers and management areas, and elevation. Distance to the management area was found to affect habitat suitability with a contribution probability from 4% to 6%. With an increase in the management area, the suitable habitat decreased. Landscape indexes showed that habitat quality decreased with management area expansion, but patch fragmentation was not aggravated. The expansion of the management area increased the range of human disturbance and had a negative impact on habitat area and quality, which adversely affected the environmental suitability for roe deer.

**Keywords:** national forest; forest management; suitable habitat; species distribution models; roe deer

### 1. Introduction

Forest management activities often have a negative impact on the habitat and living conditions of wild animals [1]. For example, Leclerc et al. (2012) mentioned that in the context of the declining global population of caribou (*Rangifer tarandus*), reducing forestry activities will help protect caribou habitat and increase their population [2]. The pattern, intensity and scope of forestry activities can affect the habitat of wild animals. These forestry activities are largely determined by the forest ownership system, which means that changes to the system guide these forestry activities. In recent years, forest rights in many areas have become more dispersed. There are a variety of management measures for the understorey layer, plus increased frequency and scope of management, which affect indicators such as the distribution, abundance and coverage of vegetation, and which also result in the spatial fragmentation of the forest landscape and habitat degradation for wild animals [3,4]. The trend towards decentralized management guides human activities, directly affecting the habitat of most wild animals [5–7]. Since 2012, commercial logging has been banned in the Lesser Xing'an Mountains.

Sustainability 2018, 10, 1211; doi:10.3390/su10041211

www.mdpi.com/journal/sustainability

The Ecology and Management of Aquatic-Terrestrial Ecotones (Man and the Biosphere Series) [H. Decamps, R.J. Naiman] on mydietdigest.com \*FREE\* shipping on.mydietdigest.com: Ecology and Management of Aquatic-Terrestrial Ecotones (Man and the Biosphere Vol 4) Series: Man and the Biosphere Vol 4 (Book 4).The ecology and management of aquatic-terrestrial ecotones (Man and the biosphere series): Books - mydietdigest.commydietdigest.com: The Ecology and Management of Aquatic-Terrestrial Ecotones ( Man and the Biosphere Series): Ships from the UK. Former Library book.mydietdigest.com: The Ecology and Management of Aquatic-Terrestrial Ecotones ( Man and the Biosphere Series) () and a great selection of eBooks The Ecology And Management Of Aquatic Terrestrial Ecotones Man And. The Biosphere Series are currently available in various formats such as.4: The Ecology and Management of Aquatic-Terrestrial Ecotones (Man & the biosphere) at mydietdigest.com - ISBN - ISBN The Ecology and Management of Aquatic-Terrestrial Ecotones. Front Cover . Ecotones Volume 4 of Man and the biosphere series, ISSN Editors, H .the ecology and management of aquatic terrestrial ecotones man and the biosphere series h dcamps rj naiman on amazoncom free shipping on qualifying offers.The ecology and management of aquatic-terrestrial ecotones. Translate with. google-logo Man and the Biosphere Series (UNESCO). Other information.Ecology and Management of AquaticTerrestrial mydietdigest.com and the Biosphere Series. TheParthenon PublishingGroup, Carnforth, United Kingdom. Naiman.The Ecology and Management of Aquatic-Terrestrial Ecotones (Man and the Biosphere Series). by R. J. Naiman. Condition: Used - Very Good.Find The Ecology And Management Of Aquatic Terrestrial Ecotones Man And The Biosphere Series book in our library for free trial. We provide copy of The.Man and the Biosphere Book Series The Man and the Biosphere Series has been launched with the aim of communicating some of the results generated by the.Ecological systems and the concept of biological organization. Proc. natl. Acad. Sci. Man and Biosphere Series. UNESCO, Paris In Naiman, R. J. & H. Decamp (eds), The ecology and management of aquatic-terrestrial ecotones. Man and.Several volumes in the Man and the Biosphere (MAB) Series a the ecology and management of aquatic-terrestrial ecotones (Volume 4).Naiman, RI. and Decamps, H. (Editors), The Ecology and Management of AquaticTerrestrial Ecotones. Man and the Biosphere Series, 4. UNESCO.

[\[PDF\] Cockatiels \(Birdkeepers Guides\)](#)

[\[PDF\] Journey Beyond Hardship:: A Practical, Hopeful Guide For Getting Through Tough Times](#)

[\[PDF\] Medicina de Emergencia, La - Tomo I \(Spanish Edition\)](#)

[\[PDF\] Proverbium: Yearbook of International Proverb Scholarship \(No. 17, 2000\)](#)

[\[PDF\] Radiant Health The Ancient Wisdom of the Chinese Tonic Herbs](#)

[\[PDF\] His Dark Promise \(Siren Publishing Classic\)](#)

