

## Old rural parks support higher biodiversity than forest remnants

Kertu Lõhmus\*, Jaan Liira

*Institute of Ecology and Earth Sciences, University of Tartu, Lai 40, 51005 Tartu, Estonia*

Received 18 May 2012; accepted 13 December 2012  
Available online 26 January 2013

### Abstract

One of the main challenges in biodiversity conservation is to curb a further degradation and loss of high-quality habitats. In agricultural matrix landscapes, the detection of alternative habitats for habitat specialists may be a solution. Historic old parks or landscape gardens around manor houses and castles are cultural heritage of nobles, but their value in harbouring biodiversity is poorly acknowledged. Therefore we evaluated the potential of old rural parks to serve as a habitat for nemoral forest species. We recorded stand structure and the presence of forest biodiversity indicators in 74 closed-canopy stands of historic parks and compared them with 93 neighbouring mature forest remnants on ancient forest land. We estimated the importance of stand structure in relation to habitat type on biodiversity indicators. Finally we suggest single-value indicator-complexes for the cost-efficient assessment of the conservation value of forests and forest-like habitats. Park stands outclassed reference forests in several individual structural characteristics, and in combined indicators of habitat quality and biodiversity. Forests had higher estimates for the combined indicator of dead wood, but large-diameter dead wood types were more abundant in parks. Woodpeckers, several old-growth indicator epiphytes and forest herbs had successfully become established in planted forest-like park fragments. Old rural parks resemble high-conservation-value forests more than the best preserved contemporary forest remnants. After the century needed to overcome immigration delay, old parks do provide a refugium for temperate deciduous forest species. Consequently, biodiversity-targeted management should retain and enhance old-growth attributes in forests and on the peripheries of parks: e.g. preserving old trees to provide service for epiphytes, hollow trees and an understorey mosaic for birds and bats; dead wood elements for saproxylic insects and fungi; limited mowing frequency and increased cutting height for forest herbs. Forestry should enhance the recovery of mixed deciduous stands and avoid conifer plantations.

### Zusammenfassung

Eine der größten Herausforderungen bei der Erhaltung der Biodiversität ist eine weitere Verschlechterung und den Verlust von Habitaten mit hoher Qualität zu verhindern. In Agrarlandschaften kann die Bereitstellung von alternativen Habitaten für Habitatspezialisten eine Lösung darstellen. Historische alte Parks und Landschaftsgärten rund um Landhäuser und Schlösser sind das kulturelle Erbe des Adels, aber ihr Wert als Rückzugsraum für Biodiversität ist bisher kaum berücksichtigt worden. Deshalb evaluierten wir das Potenzial von alten Landschaftsparks als Habitate für Laubwaldarten. Wir nahmen die Bestandsstruktur und die Anwesenheit von Indikatoren der Walddiversität in 74 Beständen mit geschlossenem Kronendach in historischen Parks auf und verglichen sie mit 93 benachbarten alten Waldüberresten an ursprünglichen Waldstandorten. Wir schätzten die Bedeutung der Bestandsstruktur in Beziehung zum Habitattyp für die Indikatoren der Biodiversität. Zuletzt schlagen wir eine aus mehreren Indikatoren errechnete Kennziffer für die Kosten-Nutzen-Abschätzung für den Erhaltungswert von Wäldern und waldähnlichen Habitaten vor. Die Parkbestände ließen die Referenzwälder in Bezug auf einige individuelle strukturelle Eigenschaften und in den kombinierten Indikatoren für Habitatqualität und Biodiversität weit hinter sich. Die Wälder hatten höhere Werte für den

\*Corresponding author. Tel.: +372 737 6178; fax: +372 737 6380.  
E-mail address: kertu.lohmus@ut.ee (K. Lõhmus).

kombinierten Indikator Totholz, aber Totholztypen mit höheren Durchmessern waren in den Parks häufiger. Spechte, einige Epiphyten, die Indikatoren für alte Bestände sind, und Waldkräuter hatten sich in den gepflanzten Wäldern der Parkfragmente erfolgreich angesiedelt. Alte Landschaftsparks ähneln Wäldern mit einem hohen Erhaltungswert mehr als die besterhaltenen derzeitigen Waldreste. Nach einem Jahrhundert, das gebraucht wird um den Ansiedlungsverzögerung auszugleichen, stellen alte Parks ein Refugium für Arten des gemäßigten Laubwaldes zur Verfügung. Als Konsequenz daraus sollte ein Management, das auf die Biodiversität zielt, die Charaktereigenschaften alter Bestände in Wäldern und den Peripherien der Parks erhalten und fördern: d.h. alte Bäume als Wuchsort für Epiphyten, hohle Bäume und ein Unterwuchsmosaik für Vögel und Fledermäuse, Totholzelemente für saproxyliche Insekten und Pilze erhalten sowie eine begrenzte Begehrbarkeit und eine erhöhte Schnitthöhe für Waldkräuter schaffen. Die Forstwirtschaft sollte die Erhaltung von gemischten Laubwaldbeständen fördern und Nadelbaumpflanzungen vermeiden.

© 2013 Gesellschaft für Ökologie. Published by Elsevier GmbH. All rights reserved.

**Keywords:** Forest biodiversity; Forest management; Landscape planning; Plantations; Refugium; Stand structure; Sustainable management; Forest fragmentation

## Introduction

Continuous logging and intensive silvicultural management have caused forest fragmentation and the degradation of habitats on ancient forest land (Grigg 1987; Östlund, Zackrisson, & Axelsson 1997; Scheller et al. 2008). Only a few percent of European forests are in a natural or near-natural state or have historic continuity (Adermann 2009; Esseen, Ehnström, Ericson, & Sjöberg 1997; Eriksson, Skanes, Hammer, & Lonn 2010; Hermy & Verheyen 2007). Most contemporary forests are young, in an early secondary-successional stage, homogeneous in their structure, and, as a consequence, host only a few forest-specialist species (Gustafsson, Hylander, & Jacobson 2004; Paal, Turb, Köster, Rajandu, & Liira 2011; Van Calster et al. 2008).

A stand's functionality to support forest-dwelling species depends on its structural complexity and historic continuity (Brunet et al. 2011; Gauslaa et al. 2007; Jonsell 2012; Nordén and Appelqvist 2001; Vojta & Drhovská 2012). Especially challenging is the conservation of forest biodiversity on nutrient-rich soils, where forests have to compete with agriculture and conifer plantations (Löhmus, Löhmus, Remm, & Vellak 2005; Pressey 1994). Furthermore, habitat conservation should be combined with improving the connectivity between protected areas (Gustafsson et al. 2004; Timonen, Gustafsson, Kotiaho, & Mönkkönen 2011), but the efficiency of stepping-stone habitats to harbour biodiversity is still a matter of debate (Hartley 2002; Hobbs, Higgs, & Harris 2009; Liira, Löhmus, & Tuisk 2012).

One potential source of ecologically functional forest habitats can be rural parks, particularly parks established on former agricultural land around manors and castles in the 17th–19th centuries. They are highly valued for their cultural heritage and aesthetic-recreational value (Cranz & Boland 2004). In the peripheral less-managed sections of these parks, tree plantations have developed into closed-canopy stands and started functioning as forest-like habitats (Glendell & Vaughan 2002; Jonsell 2012; Liira et al. 2012).

Forest inventories and monitoring schemes use a wide range of structural characteristics and indicator species to

estimate habitat quality or conservation value (Liira, Sepp, & Parrest 2007; Lindenmayer, Margules, & Botkin 2000; Löhmus & Kraut 2010; Noss 1999; Scheller et al. 2008). In policy planning, however, single-value indicators are preferred; either as a single indicator trait or derived from a combined set of indicators (McElhinny, Gibbons, Brack, & Bauhus 2005)

We hypothesized that closed-canopy stands in historic rural parks have obtained structural properties resembling nemoral forests and are able to support forest-specific biodiversity in regions where forests are fragmented by agricultural matrix landscape and degraded by repeated loggings and conifer plantations. In order to test this hypothesis, we quantified the habitat quality of mature closed-canopy stands of old Estonian manor parks in comparison to neighbouring mature forests in terms of stand structure and the presence of various biodiversity indicators.

## Materials and methods

### Study area

Our 200 km × 120 km study region (centroid coordinates: 58°24'50"N and 25°57'30"E) is located in the southern half of Estonia, in historic northern Livonia. The region has a mosaic of nemoral and boreal habitats, and is considered to be part of the hemiboreal (boreo-nemoral) vegetation zone of northern Europe (Ahti, Hämet-Ahti, & Jalas 1968). Local climate is characterized by average precipitation of 600–700 mm per annum, average summer temperature of 16.3–17.4 °C in July, and average winter temperature of –7.4 to –2.0 °C in February (Aunap 2011).

Rural parks in Estonia were planted around manors, which had a central location in historical agricultural landscapes (Abner, Konsa, Lootus, & Sinijärv 2007). These parks have been dynamically designed over a century or two and present-day parks represent mosaics of various planning styles – open and regular French-style around buildings and more relaxed English-style landscape gardens in remote areas (Abner et al.

Download English Version:

<https://daneshyari.com/en/article/4384203>

Download Persian Version:

<https://daneshyari.com/article/4384203>

[Daneshyari.com](https://daneshyari.com)