

Bird assemblages in a mixed woodland–farmland landscape: The conservation value of silviculture-dependant open areas in plantation forest

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Abstract

Although considered by some as a less “ecologically suitable” forestry model than “near-natural” stand management, even-aged plantation forest management, with regeneration procedure involving clearcutting, creates temporary habitat for many early-successional birds. The present study addresses the question of the conservation value for birds of clearcutting-related open areas in European temperate forest, in the context of a mixed woodland–farmland landscape. The point count technique was used to census the breeding birds on 300 sampling plots, distributed in the eight main habitat types of the Ardenne region (southern Belgium), including agricultural land, edge habitats, closed forest habitats and open areas in forest. Most of these open areas in forest derive from clearcutting practices, rapidly planted with young Norway Spruce (*Picea abies*). We quantified the conservation value of a given habitat type by using a “conservation value index”, integrating the frequency of occurrence of each species in the considered habitat and their conservation status in Europe or in southern Belgium. Both conservation value index and species richness were higher for edge habitats and open areas in forest, compared to forest interior and agricultural land. Detrended Correspondence Analysis of the plot species lists showed that bird assemblages from open area in forest are not intermediate between forest and agricultural open land, as opposed to external edge habitats. Hence, open areas in forest do not contain bird assemblages composed of forest species mixed with colonizing agricultural species but rather shelter specific bird assemblages. An Indicator Species analysis further emphasized this specificity and identified seven species, which, in the Ardenne context, form a group of species specific to open areas in forest. Due to major changes of land use in the Ardenne during the 20th century, which leads to a tremendous decrease of moor, heath and fallow land areas, clearcut openings in the plantation forest progressively gained high conservation value at the regional scale. Further studies about habitat requirement of the conservation interest species inhabiting these open areas is needed, including a better understanding of how early-successional species react to forest planning. If plantation forestry evolves to an uneven-aged and more permanently closed forest, then other options, including semi-natural habitat restoration, are urgently required to save early-successional bird communities.

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1. Introduction

In Europe, tremendous changes of human land use have had an impact on bird fauna for more than 5000 years (Blondel, 1997). While human-induced changes first lead to a diversification of the bird fauna at the landscape scale, continuous increase of human impacts during former century is now leading to a global decline of a significant part of the bird fauna (Tucker and Heath, 1994). In part of temperate Europe at least,

one of the major landscape impact of human activity is the afforestation of large surfaces, unsuitable for agriculture speculation, by plantations of conifer species, cultivated intensively in even-aged stands. In Wallonia (southern Belgium), the exotic Norway Spruce *Picea abies* plantations cover now 171,000 ha, equivalent to 31.4% of the total forest cover and 10.1% of the total surface (Lecomte et al., 2003). Compared to the semi-natural broad-leaved forest in Wallonia, spruce plantations do not show a lower bird species diversity at the forest scale, mainly because the regeneration of pure even-aged stands generally involves clearcutting practices, which involuntarily creates favourable habitat to open habitat or bush-associated bird species (Baguette et al., 1994; Deceuninck and

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Baguette, 1991). In Great Britain, the utility for biodiversity conservation purpose of inadvertently created open habitat in plantation forest has already been described and integrated in management plans (Avery and Leslie, 1990; Fuller and Browne, 2003). In North-eastern United States, integration of conservation concerns in forest management programs are suggested as a possible solution to halt major decrease of early-successional specialist bird species (DeGraaf and Yamasaki, 2003).

However, even-aged stands, and the related clearcutting practices, are considered by some as a less sustainable forestry model than mixed uneven-aged stands, in particular by the partisans of the so-called “close-to-nature” forestry (Carbener, 1995; Colak et al., 2003). Arguments against clearcutting practices and even-aged silviculture ranges from soil and water quality protection (Akselsson et al., 2004) to aesthetic concerns and economic considerations (Nord-Larsen et al., 2003). In some cases, depending on landscape and management contexts, clearcutting practices in managed temperate forest are also believed to be detrimental to some specialized forest species while being favourable to non-forest species (Du Bus de Warnaffe and Lebrun, 2004).

The debate at this level concerns mostly conservation value attributed to fauna and flora communities colonizing clearcut areas, compared to communities of other habitats: are the species associated to clearcuttings of sound conservation interest? Are these species generalist organisms, using clearings as a surrogate habitat of their original agricultural habitat, and competing forest interior specialists? To address these questions, we chose breeding birds as an indicator group and we compared bird assemblages in different habitat including high forest, agricultural land, clearcuts and young stages of plantation forests. Most ecological studies comparing bird communities among forest successional stages do not include comparison with neighbouring non-forest habitat like agricultural land and edge between forest and non-forest habitats (Imbeau et al., 2003). The aim of the present study is to consider breeding bird diversity in clearcut openings in a landscape perspective, comparing bird assemblages among closed forest, agricultural open habitat and forestry-induced openings, in a mixed woodland–farmland landscape typical of southern Belgium, and of a large part of north-western Europe. In our study area, forests dominate in area but closed forest are fragmented by both agriculture and silviculture-dependant openings, a situation which offers an interesting case study (Imbeau et al., 2003).

Breeding bird census were conducted on 300 plots, dispersed in all major land cover type of the study area, except human habitat and riparian system. We compared species lists to characterise the specificity of each habitat type bird assemblages and, using a conservation value index, the relevance of Open Areas in Forest (OAF) for conservation interest. Bird assemblages in OAF are original, compared to bird assemblages of all other habitat in the region, and include several species of conservation interest that use specifically OAF in the present-day Ardenne landscape. This implies that, as long as the forestry practice will include clearcutting procedure as regeneration method of the plantation forest,

advantage should be taken of the existence of these open areas in forest for the conservation of an endangered part of the bird fauna, and probably also of other biological groups.

2. Material and methods

2.1. Study area

Our study area was located in southern Belgium (Wallonia), in the central part of the geographical region known as the “Ardenne” (Fig. 1). The present-day Ardenne landscape is dominated by woodlands, which account for 50% of the regional ground cover, either semi-natural temperate broad-leaved forests corresponding to the *Luzulo-Fagetum* or *Luzulo-Quercetum* associations (Noirfalise, 1984) or artificial coniferous plantations, mostly Norway Spruce *P. abies*. In many instance, these plantations were installed since the 19th century to replace coppice-woodland or moor land, heath land, meadows on poor soils, neglected by modern agriculture, and to meet national needs in wood resources (Noirfalise and Thill, 1975). Agricultural activities are now mainly focused on intensive pasture meadows.

In our study area, covering 760 km², broad-leaved forests accounts approximately for 40% of the land cover, coniferous plantations for 30%, permanent meadows for 20%, arable land for 4.5% and human habitations cover less than 1%. Altitude ranges from 200 to 570 m in the sampling area, which is characterised by a climate both humid (annual rainfall between 1100 and 1300 mm) and cool (mean annual temperature of about 7.5 °C). The relief in the higher altitude is a plateau, more undulated lower in altitude, with some deeper river valleys.

2.2. Bird counts

To sample breeding bird communities, we used the classical point count technique with unlimited distance (Bibby et al., 1992) which, contrary to other more precise but time-

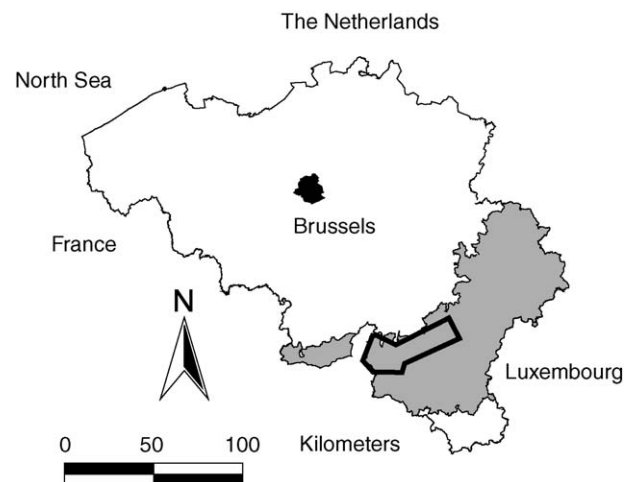


Fig. 1. Localisation of the study area (black polygon) in Belgium. The shaded surface corresponds to the Ardenne region.

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