

# The impact of habitat characteristics on bird presence and the implications for wildlife management in the environs of Ottawa, Canada

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## Abstract

Urban forestry is increasingly vital for both wildlife conservation and human use, despite frequent conflicts between these functions. A fundamental task in urban habitat and recreation forestry is the identification of those habitat characteristics important for animal species and the evaluation of these within the geographies of human presence, urban proximity and land cover variation and change. This paper examines the habitat characteristics for birds in urban built, green and greenbelt areas of Ottawa, Canada, and an area of continuous Ontario forest, to determine the effects of vegetation density and patch size, and human presence on bird presence. Bird presence was measured by point counts, and land cover was mapped using field observation and aerial photographs (1955 and 1999). At the species level, the pre-dominantly forest birds were affected by human presence and were primarily associated with tree stands in the greenbelt and continuous forest. In dense urban areas there were larger numbers of a few 'generalist' species. Both forested and urban (residential/commercial) environments increased in area between 1955 and 1999, creating the two types of land cover favouring the largest number of birds, while the less habituated grass/farmed areas declined in area. More informed bird conservation and recreation management will depend on paying greater attention to vegetation cover combinations with urban development.

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**Keywords:** Forest; GIS; Greenbelt; Habitats; Urban

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## Introduction

The development of greenbelts, and even smaller urban green spaces, in partnership with increased urbanisation is a major current issue (Fernandez-Juricic, 2000; Park and Lee, 2000; Chace et al., 2003; Hostetler and Knowles-Yanez, 2003; Konijnendijk, 2003; Kuhn, 2003; Morancho, 2003; Savard et al., 2000; Chiari and Seeland, 2004; White et al., 2005). Factors for this include increased rates of urbanisation, the recreational

and health needs of urban dwellers and the conservation of wildlife (Bird et al., 1996; Belant, 1997; Jokimaki, 1999, 2003; Pirnat, 2000; Fernandez-Juricic, 2000; Savard et al., 2000; Chiari and Seeland, 2004; Cornelis and Hermy, 2004; Erickson, 2004). This development is contemporary with increased awareness of the ecological value of urbanised green areas. Greenbelts are particularly important for conservation and recreation, considering their large size, proximity to urban centres, frequent links to rural areas, and mixed land cover. Greenbelts have a wide range of definitions, but the commonest is an area of tree, shrub and grass development, partially or wholly surrounding an urban

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area, where limited urban development is permitted, in some cases encircled by rapid urbanisation (Spiwak, 1996; Clergeau et al., 1998; Campbell, 2002).

Within greenbelts, landcover variables such as vegetation patch size, forest type and fragmentation and human presence are important for avian presence (Marzluff et al., 2001; Campbell, 2002; Turner, 2003; Vuorisalo et al., 2003; Lim and Sodhi, 2004). However, the impact of patch variation and urban intensity is debated (Jokimaki, 1999, 2003; Cooper, 2002; Konijnendijk, 2003; Donnelly and Marzluff, 2004). Blair (2004) argues that urbanisation may influence 'clear changes in the bird community as a whole' and this may result in greater species diversity in areas of intermediate urbanisation, and declines with either greater or less development. Fahrig (2002) also points out that habitat loss has a larger impact on birds than habitat fragmentation. Therefore, the total amount of forest cover may be more important than forest patch size and shape. These hypotheses justify studies of the impact of urbanisation, human presence, forest patch size and fragmentation and vegetation on the presence of birds. Fundamentally, can a study of these variables increase our knowledge of avian presence in greenbelts, and how may we be informed by comparative studies of more and less urbanised landscapes? Such a comparison is instructive, because it may shed light on the factors for species presence and absence in specific landcover types with the complex mosaics of greenbelts. Despite several studies of avian habitats along urban/rural gradients, few studies have focussed on different habitat types to evaluate their status and quality in greenbelts (Jokimaki, 1999; Marzluff et al., 2001; Campbell, 2002; Turner, 2003; Vuorisalo et al., 2003; Lim and Sodhi, 2004).

The greenbelt of Ottawa (45°19'N, 75°40'W, population 774,072 Statistics Canada, 2004) (Fig. 1) is one of the largest in North America, developed mostly on former farmlands cleared from 19th century forests (Historical Atlas of Carleton County, 1879; Larson et al., 1999; Erickson, 2004). The Holt Report (1915) initiated greenbelt planning, by recommending the creation of 1214 hectares of recreational parkland (Federal Plan Commission of Ottawa and Hull, 1915). From 1950, the greenbelt plan of Jacques Greber (Greber, 1950) was implemented (National Capital Commission (NCC, 1996, p. 15)). The main implementing agency, the NCC, founded in 1958, created the forested greenbelt through the purchase of private lands (Hough Stanbury Woodland Limited, 1991). The final greenbelt area covers approximately 200 km<sup>2</sup> of the National Capital Region (NCR) around Ottawa (Wickware and Rubec, 1989; NCC, 1996). The greenbelt is linked to over 300 smaller parks within Ottawa (City of Ottawa, 1991; Campbell, 2002). Satellite towns around Ottawa (Kanata, Orleans, Leirtrim, South Gloucester

(Riverside South), Stittsville and South Nepean) have virtually encircled the greenbelt.

The objectives of the greenbelt policy were the control of urban sprawl, the promotion of recreational use and animal and plant conservation (Brownell and Larson, 1995). The Green Belt Master Plan (NCC, 1996) re-emphasised the conservation objective. However, current problems include intensive human recreational presence, increased mammal road kills, the possible development of green corridors over built features and the bisecting road links between Ottawa and its satellite towns (Campbell, 2002). Although studies have been conducted of the ecological and recreational status of the greenbelt, there are few multi-species and comparative studies of avian presence, and the evaluation of this in comparison with external continuous forest and urban parks, to assess species gains or losses in relation to greenbelt landcover (Campbell, 2002; Erickson, 2004). The purpose of this paper is to assess the impact of urban proximity and vegetation variation on birds in the greenbelt, specifying the key habitat characteristics and examining three landcover types: (1) built and green areas in Ottawa; (2) selected sites within the greenbelt; and (3) two areas of continuous forest outside the greenbelt. This study takes the greenbelt and compared areas as examples from the boreal forest climate zone, as a case study that may have wider application, allowing for bird and plant species, and climate variation.

## Methodology

The research design involved a field survey of birds and a land cover survey using aerial photographs and ground recording. The bird survey was conducted from April 2001 to August 2002 (minus the heavy snow period of winter between January and April 2002). A point count was used, with a grid-based pattern of 240 survey points (200 m apart) (Table 1). There were eighty survey points in each of: (1) built-up and green spaces (Ottawa, Kanata and Bells Corners); (2) the western greenbelt; and (3) two areas of continuous mixed deciduous and coniferous forest, near Christie Lake, Ontario (latitude 44.822; longitude -76.4134), and Gatineau forest, Quebec (hereafter referred to as the 'continuous forest': latitude 45.5601; longitude -75.9385). The areas sampled for each area, were approximately even in size. The observer stood at each point for at least eight times over the study period. Green space' refers to any area of at least 100 m<sup>2</sup> of grass, shrub and/or grass, and trees including parks, avenues and lawns. In these areas, there were small (under 500 m<sup>2</sup> of fragmented primary forest, and mixed tree-shrub stands). Built-up areas composed: (1) at least 1 hectare of concrete, tarmac or wooden structures, with

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