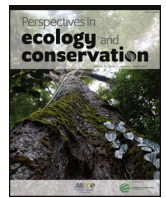




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Research Letters

Bird-grassland associations in protected and non-protected areas in southern Brazil

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ABSTRACT

Conversion of grasslands in other land uses is the main threat for grassland birds. We investigated habitat use by grassland birds in Permanent Preservation Areas surrounded by *Eucalyptus* plantation stands and non-protected grasslands (grazed native grasslands). As there is no evidence whether Permanent Preservation Areas are effective habitats for grassland avifauna, we compared such areas with grazed native grasslands, regarding richness, abundance and composition of grassland birds. Short and tall grassland bird specialists were recorded, with some species related to the non-protected areas and others to the protected areas. Thus, both areas are fundamental habitats for conservation of grassland bird species. We highlight the importance of grassland mosaics to maintain grassland bird species. Furthermore, we highlight the necessity of maintaining Permanent Preservation Areas in ranching and cropland areas, in order to connect grassland remnants in an extremely converted landscape and to conserve especially bird species that are more sensitive to disturbances.

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Introduction

Grassland ecosystems are among the most threatened at global scale due to the great disparity between habitat loss and the low percentage of protected area (Hoekstra et al., 2005). Such ecosystems are submitted to strong anthropic pressure owing mainly to changes in land-use caused by monocultures (Azpiroz et al., 2012; Develey et al., 2008). In Brazil, grasslands of Pampa biome have a high degree of degradation, in the state of Rio Grande do Sul more than 50% of native grasslands has been converted mainly for agriculture and forest plantations (Bencke, 2009; Fontana et al., 2016).

Afforestation and agriculture with nonnative species have expanded over grazed native grasslands in extensive areas of Pampa biome (Azpiroz et al., 2012). The traditional cattle production is a compatible activity with conservation biodiversity if adequately managed (Develey et al., 2008; Isacch and Cardoni, 2011). The moderate grazing does not cause the suppression of native vegetation, maintaining the main characteristics of grassland

ecosystems (Overbeck et al., 2007). On the other hand, tree monocultures totally replace the native local vegetation structure, affecting distribution of bird populations by reducing availability of resources that are important for nesting and feeding (Codesido et al., 2008). Tree plantations are known to alter the structure of bird communities in forest ecosystems, benefiting generalist and edge bird species (Jacoboski et al., 2016). However, in grassland landscapes, tree plantations can have more detrimental effects in birds than in forest ecosystems (Filloy et al., 2010).

The legal protection can effectively avoid conversion of native grasslands into other uses, and thus prevent complete loss of grassland biodiversity (Overbeck et al., 2007). Legal protection measures proposed by the Brazilian Forest Code determine the areas that must be preserved and which regions are allowed for cultivation, law n° 12.651/12 (CFB, 2012). Between the vegetation to be protected, is the marginal vegetation surrounding aquatic ecosystems. This vegetation, denominated Permanent Preservation Area (PPA), must be maintained by the delimitation of a buffer zone for both margins, which varies according to the width of a water course. A PPA consists of a protected area, covered or not by native vegetation, with the environmental function of preserving water resources, landscape, geological stability, and biodiversity, as well

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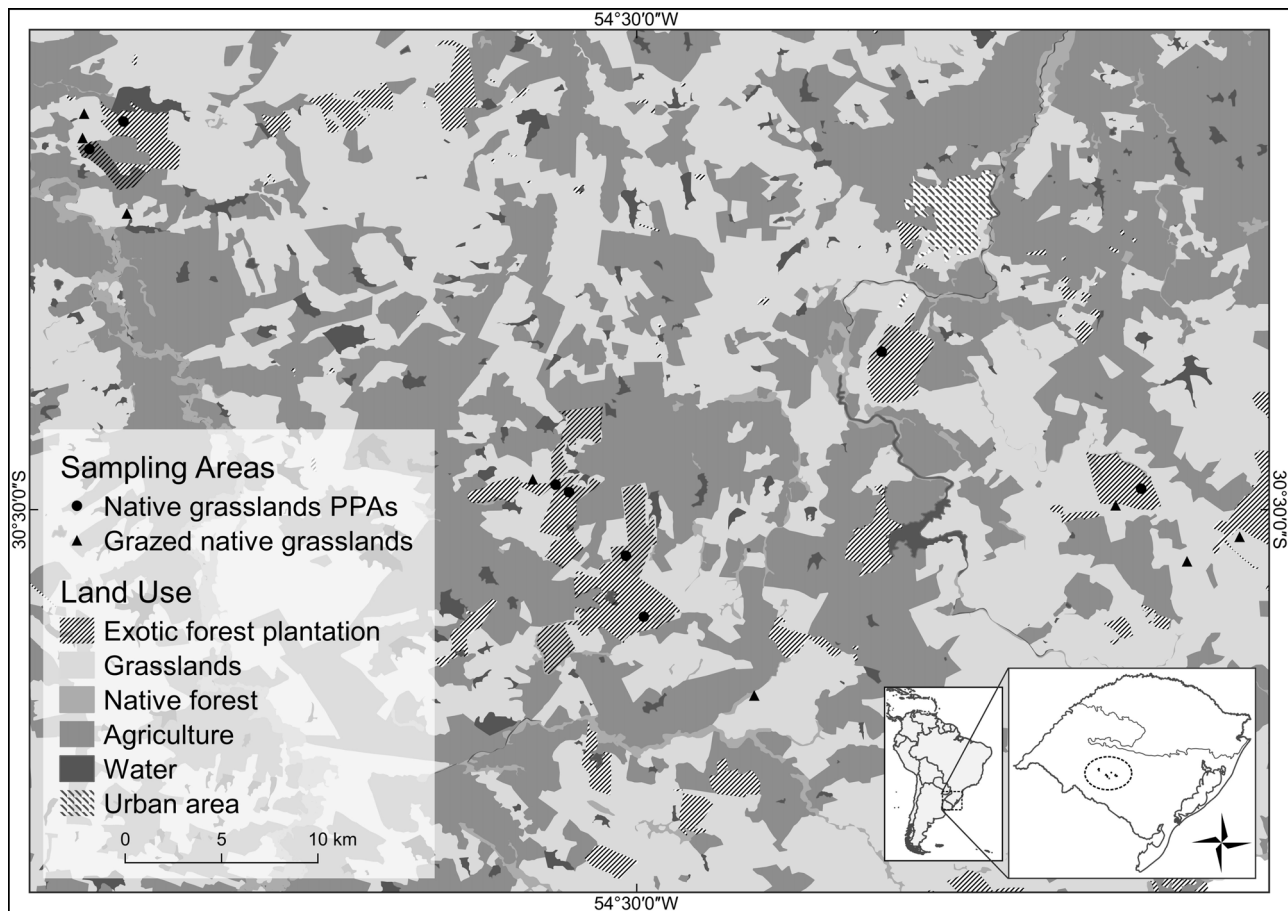


Fig. 1. Location of the study area in the state of Rio Grande do Sul. Circles represents sampled grazed native grasslands and triangle Permanent Preservation Area.

as of facilitating genetic flow of fauna and flora and protecting the soil. In tree plantations, the regulation of law is performed, however, in cattle ranching farms or soybean, such regulation is often not maintained, and when maintained, the tendency is to consider forest vegetation more than non-forest vegetation, even in grassland biomes (Develey et al., 2008; Overbeck et al., 2015).

Our goal was to investigate whether protected native grasslands (PPAs within *Eucalyptus* plantation stands) are viable to grassland birds. Furthermore, we aimed to identify whether these species are different from those recorded in non-protected areas (grazed native grasslands). Toward this aim we compared richness, abundance and composition of bird species between PPAs and grazed native grasslands. We hypothesized that (1) PPAs are viable for grassland species use because *Eucalyptus* stands are located in a matrix of grassland vegetation and possess connections among native grassland areas; (2) species composition should differ between protected and non-protected grasslands areas due to their differences in vegetation structure caused by grazing.

Material and methods

Study area

We conducted the study in two types of grassland vegetation: eight non-grazed PPAs located within *Eucalyptus* plantation stands (surrounded by eucalyptus), and eight areas of grazed native grasslands, for a total of 16 sample sites. These sites are located in the South Region of Brazil, in the municipalities of São Gabriel (30° 20'11" S, 54° 19'12" W) and Rosário do Sul (30° 15'30" S, 54° 54'51" W). The study area is located in the Pampa biome. Each

Eucalyptus stand comprises a distinct silviculture area for cellulose production. The eucalyptus plantations had ages of cultivation between four and six years, which superior height to 15 m. For each of the eight *Eucalyptus* stands, adjacent areas of grazed grassland were sampled (Fig. 1).

The sampled sites were first selected using Google Earth (2014) images and subsequently checked in the field. The main characteristics taken into account for site selection were that sites for both PPAs and grassland areas should possess native vegetation and, specifically for PPAs, they should have predominantly grassland vegetation and be 100 m wide minimum. The PPAs composed of mostly forest vegetation were not included. The selected PPAs are located within *Eucalyptus* stands, protect margins of small water courses and have a minimum width of 100 m and varied length that depends on the forest stand size. No type of management is allowed within PPAs (e.g. ranching, fire). For the grazed native grassland, we included the sites that experienced low to intermediate grazing intensity and all pasture sites also had water courses, though without PPA delimitation.

Bird sampling

We carried out bird sampling once at each one of the 16 sites during the austral spring, between 2014 and 2015, including two reproductive seasons. Bird sampling was undertaken by applying the point count method (Bibby et al., 1992). We distributed the count points according to site size, ranging from three to nine points equally separated from each other by a distance of 200 m. We recorded all bird species seen or heard during a period of 10 min within a 50 m radius around each one of the points. We sampled

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