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Land use in German Biosphere Reserves and its ecological impact

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Abstract

Biosphere Reserves aim to be model regions for sustainable development, including land use. We analyse the agriculture within the transition zones with respect to the farming systems and recent developments. We then assess the functions of agriculture in terms of biodiversity conservation at the example of farmland birds and buffering environmental impacts of agriculture on protected areas.

Keywords

Biosphere Reserves, agriculture, ecosystem services, transition zones

Introduction

Biosphere Reserves (BRs) aim to be model regions for sustainable development, including land use. At the same time, BRs aim at the conservation of valuable habitats and species. To be able to integrate these aims, each Biosphere Reserve has three zones, each with different focus: Core zones primarily to conserve biological diversity and no human land use, buffer zones in which land use can be conducted if in line with the conservation goals, and transition zones, in which land use systems should be developed which support the main goals of transition zones, i.e. sustainable land use, including the conservation of habitats and species, buffering sensitive habitats and habitat connectivity.

While agricultural land use in buffer zones is typically regulated through restrictions, it is unclear if agriculture in transition zones does meet the required standards. Therefore, as a first step, we conducted a survey of agricultural land use in transition zones in three terrestrial German BRs ('Spreewald', 'Schorfheide-Chorin' and 'Flusslandschaft Elbe Brandenburg') and inferred some relations to the conservation of biodiversity, using bird species as example, and made assessments about the spatial relations between arable land in transition zones and protected areas.

Methods

Case study regions

The three terrestrial German BRs are located in the Federal State of Brandenburg in the eastern part of Germany. The BR 'Spreewald' is a unique landscape within a part of the wide valley of the river Spree and is characterized by a network of small artificial watercourses, a mosaic of meadows and riparian forests (GRUNDMANN 1994). The dominating land use within the transition zones is agricultural grassland and arable land. The BR 'Schorfheide-Chorin' is a landscape of glacial origin with an undulating surface and home of more than 200 lakes, cattle holes, riparian habitats, fens, old beech forests with international recognition as well as valuable dry grassland sites (FLADE et al. 2006). The BR 'Flusslandschaft Elbe Brandenburg' is part of the larger BR 'Flusslandschaft Elbe' along the river Elbe with its characteristic habitats, like the floodplain forests and complex grasslands, and wildlife, e.g. white storks and beavers. Land use is mainly agricultural with arable land (31%) and grassland (29%).

Analyses

We used geodata, like data on arable land use, soil fertility and protected areas and habitat types, as well as statistical survey data on agriculture, like shares of cultivated crops, farm sizes and farm types etc. We processed the data using GIS with three aims: i) to characterize the agricultural production (cultivated crops and regional management practice including intensity and typical agricultural activities), ii) to assess potential interrelations of protected habitats on-site and off-site the agricultural fields with the farmland use, iii) to assess the suitability of farmland for typical farmland birds.

To evaluate the protected habitats and their requirements in terms of agricultural management we used habitat mapping results, habitat descriptions, including the appropriate management for conservation, sensitivity to agricultural impacts, and geoprocessing. To assess the suitability of farmland for typical bird species we applied a habitat suitability model (GLEMNITZ et al. 2015).

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