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ScienceDirect
Landscape and Urban Planning 79 (2007) 77–83
LANDSCAPE AND URBAN PLANNING
This article is also available online at:
www.elsevier.com/locate/landurbplan

The importance of marginal habitats for the conservation of old trees in agricultural landscapes

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Received 15 February 2005; received in revised form 20 November 2005; accepted 14 March 2006
Available online 23 May 2006

Abstract

Deterioration of unfarmed habitats resulted in a considerable decrease of biological diversity in agricultural landscapes. The most important elements of cultural landscapes determining a high level of biological diversity are woodlots and the trees themselves. This paper presents the results of a study carried out in 2000–2001 on the distribution and number of champion (heritage) trees on the area of 5480 ha of intensively managed agricultural land (Lower Silesia, south-western Poland). The fieldwork consisted in localizing and measuring all champion tree specimens on the area of 5480 ha of an agricultural fragment of Wrocław Plain (Lower Silesia Province, SW Poland). Champion trees were found in 116 (50.1%) of all 228 surveyed sites. The overall number of champion trees in the study area was 493, belonging to 34 species. The most numerous were native species (276 specimens). The four species of cultivated trees amounted to 40% of all champion trees. The largest percentage of habitats with at least one champion tree specimen was characteristic for manor parks (100%), the lowest—for village areas (27.8%) and mid-field clumps (39.2%). A high, statistically significant correlation was found between the size of a mid-field clump and the number of champion trees it contained. The highest number of champion trees was found in water-edge hedgerows. The current occurrence of champion trees in the agricultural landscape is the result of many centuries of rural areas management. Apart from a number of exotic species of trees, introduced mainly for aesthetic reasons to the inhabited areas (villages, parks, cemeteries), many champion specimens of native trees have survived in mid-field woodlots, planted and managed in the past due to their high economic value (*Quercus robur*, *Fraxinus excelsior*, *Ulmus laevis*). The pattern of occurrence of native champion trees indicates that some of them may arrived here as a result of natural processes, such as dispersion (e.g. *Crataegus monogyna* and *Rhamnus cathartica* that occurred in mid-field clumps).

Keywords: Woodlots; Hedgerows; Landscape management; Tree protection; Historical green areas

1. Introduction

In many areas of the world a dramatic decrease in biological diversity of agricultural landscapes can be observed, as a result of intensification of agricultural production. The occurring changes are related to simplification of farmed landscape structure and disappearance of mid-field refuges, mainly woodlots and hedgerows (Burel and Baudry, 1990; Agger, 1996; Macdonald and Johnson, 2000). Many plant and animal species, characteristic for agroecosystems are now rare and on the verge of extinction (Robinson and Sutherland, 2002). Results of studies conducted in Europe and North America on the distribution of flora and fauna in intensive agricultural landscapes unequivocally emphasize the need for preservation of areas excluded from agricultural use as biotopes for wildlife (Le Cour et al., 2002; Marshall and Moonen, 2002; Boutin et al., 2003).

The most important elements of agricultural landscapes, decisive for a high level of biological diversity are woodlots, together with the trees themselves (e.g. Le Cour et al., 2002; Marshall and Moonen, 2002). Fragments of a dead tree constitute a foodstuff for many saproxylic insects (Jonsell et al., 1998) and entomopathogenic microorganisms (Bałazy, 1997). The presence of old cavity trees offers breeding sites and shelter for birds, rodents, bats and many other groups of organisms (e.g. Entwistle et al., 2001; Rowston et al., 2002).

Previous studies on the importance of mid-field refuges for preservation and conservation of wild species of flora concerned mainly the occurrence of herbal plants, including rare and endan-

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0169-2046/$ – see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.landurbplan.2006.03.005

gered species, in various types of hedgerows and woodlots (e.g. Jacquemyn et al., 2002; Zechmeister et al., 2002; Boutin et al., 2003) and species composition of woodlots and hedgerows (e.g. Mikk and Mander, 1995; Boutin et al., 2003; Orłowski and Nowak, 2005). Apart from acting as refuges, woodlots, especially linear ones, such as hedgerows, play an important role as ecological corridors (Le Cour et al., 2002), facilitating dispersion of forest species of flora (Corbit et al., 1999; Boutin et al., 2003). However, there are no publications devoted to the importance of uncultivated areas as refuges for champion trees.

According to the definition given in nature protection acts, champion trees are those, which, owing to their outstanding age, size and physical condition, constitute an exceptional value, both natural and cultural (TROBI, 2003; Ministry of Environment, 2003; Jim, 2004). In many countries of Europe and the United States, national registers of champion trees are kept, usually by forestry services or nature conservation bodies. Studies devoted to champion trees so far have the character of general lists of the largest specimens occurring throughout Poland (Pacyniak, 1992) or other countries (TROBI, 2003; see also Jim, 2004). Information on localization of champion trees can be found in many local tourist guides and descriptions of localities. In many places the presence of champion trees is regarded as a tourist attraction.

The aim of the work was to identify the number and places of occurrence of champion trees in the intensively used agricultural landscape of Wrocław Plain (SW Poland). In this study we examined: (1) what factors determine occurrence and composition of champion trees in modern agricultural landscape? and (2) does occurrence and composition of champion trees depend upon habitat type? Knowledge of champion trees distribution in different unfarmed biotopes, if followed by its practical application in landscape planning and biodiversity preservation, may become they key to the maintaining or recreation of ecologically sustainable rural landscapes.

2. Materials and methods

2.1. Study area

The fieldwork consisted in localizing and measuring all champion tree specimens on the area of 5480 ha of an agricultural fragment of Wrocław Plain (Lower Silesia Province, SW Poland) (Fig. 1). This plot is representative for agricultural areas of lowland Poland. According to regional criteria of Kondracki (1988), the discussed region is situated within the two mesoregions—Odra Primordial Valley and Wrocław Plain, which belong to the greater physiographic unit of Silesian lowland. The study area is located in the central part of Lower Silesia Province, bordering with Wrocław city from the north. Wrocław Plain and thus the study area is characterised by one of the lowest in Poland woodland shares, barely amounting to 1.5% of area. A characteristic element of the area is a dense network of drainage ditches filled with water periodically as well as small watercourses with water flowing all year round. The overall length of the courses and ditches is 75.7 km. The study area

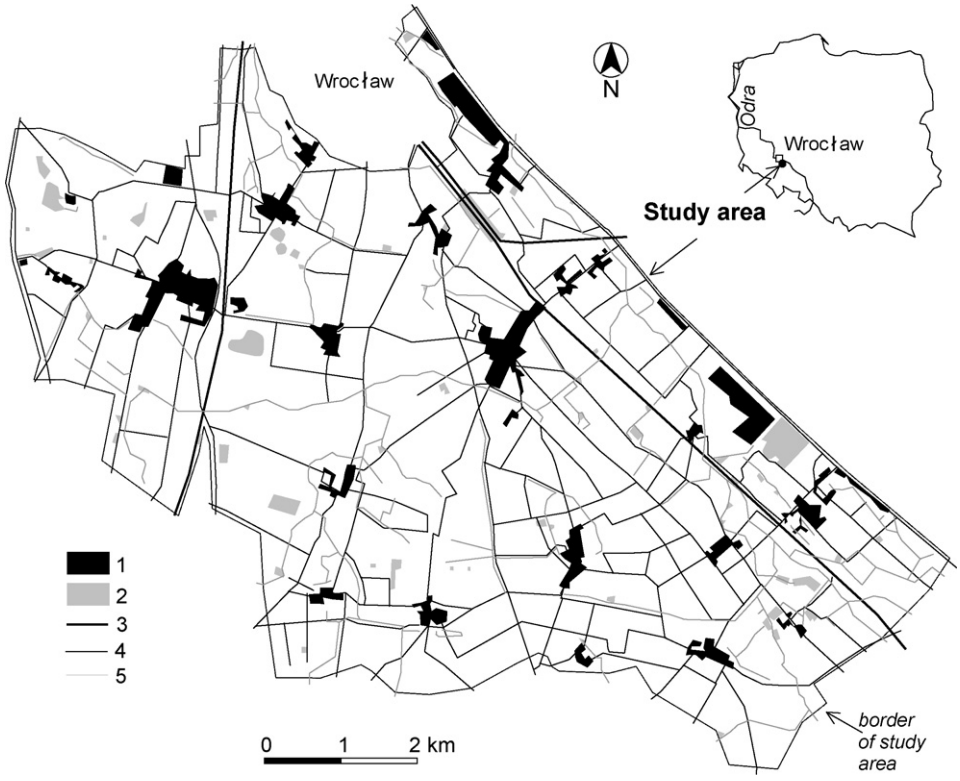

Fig. 1. Study area in the vicinity of Wrocław city (SW Poland) with linear and patch landscape elements: (1) built-up areas; (2) mid-field clumps; (3) railway lines; (4) roads (with avenues); and (5) watercourses and drainage ditches (with water-edge hedgerows).