Ecological Questions 34 (2023) 3: 83–92 http://dx.doi.org/10.12775/EQ.2023.027

Open questions about the farmlands' biodiversity preservation in the cities' peripheries – a Wrocław case (Poland)

Ewa Fudali[1], Magda Podlaska[1], Anna Koszelnik-Leszek[1,*], Mariusz Szymanowski[2]

[1]Department of Botany and Plant Ecology, Wrocław University of Environmental and Life Sciences,
pl. Grunwaldzki 24a, 50–363 Wrocław, Poland
[2]Institute of Geography and Regional Development, University of Wrocław,
Pl. Uniwersytecki 1, 50–137 Wrocław, Poland
[*]Corresponding author e-mail: anna.koszelnik-leszek@upwr.edu.pl

Received: 3 November 2022 / Accepted: 3 March 2023

Abstract. One of the necessary conditions for sustainable development is maintaining and developing environmental resources. The paper presents and discusses the idea that the field woods in the cities' agricultural periphery, understood as habitats and not only a collection of trees, should be preserved and managed as a formal element of urban green infrastructure (GI). According to the authors, they should be seen as a great connecting element between urban green and the semi-natural areas outside. Even assuming the future land use transformation, it is worth preserving them from degradation just now. They play a role in protecting natural resources and the functions of ecosystems, expected from elements of GI, as they are a source of dispersion of various species of plants and animals benefit both for agricultural areas located further and for greenery in built-up areas. Using the authors' own research on the farmland area situated within Wrocław administrative borders, and available literature, the following issues were considered: 1) the geographic and topographic characteristics of field woods, 2) evaluation of the role of field woods studied for the local biodiversity, 3) the risk factors for the degradation or disappearance of field woods and their biodiversity, 4) the legal regulations concerning the protection of field woods in Poland. Some legal and practical solutions are suggested.

Keywords: biodiversity, landscape structure, field woods, land-use planning, sustainable development, green infrastructure, rural-urban fringe.

1. Introduction

Urban sprawl is observed in almost all parts of the world but the intensity of process and its course as well as environmental consequences vary in details (Hlaváček et al., 2019). In Poland, like in other post-socialism countries, intensive urbanization and suburbanization started much later than in countries of Western Europe, only in the 1990s, after the political transformation. However, at the beginning of the 1970s, the administrative area of many Polish cities was significantly enlarged (even by 40–50%) by adding neighboring villages and agricultural lands, which were planned to be built-up in the future. The economic crisis, which developed since the mid-1970s caused a collapse in housing development and significantly slowed down the processes of those cities suburbanization. Thus, at the beginning of the 21st century, arable fields and grasslands still occupied a large part of the acreage of many Polish cities. However this picture has been changing visibly in the two last decades due to constant and still accelerating urbanization.

That change in the land use from agricultural to urban areas is resulting in many consequences, including landscape and natural resources changes (Elmqvist et al., 2016) and the contraction of farmland around expanding cities (Paül & McKenzie, 2012). Research in the suburbs of Warsaw has shown that the building of city peripheries run in many directions simultaneously. Initially along the main roads, what pushed urban elements deeply in farmland landscape and transform it into the mosaic of typically urban (built-up) and rural, often still cultivated, areas (Solon, 2009).

In contemporary planning concepts, agricultural land has many functions and food production is only one of them. Non-production functions are: limiting carbon dioxide emissions, preventing soil erosion, retaining rainwater and maintaining water levels, as well as protecting local native biodiversity (Clergue et al., 2005; Tscharntke et al., 2012). In the conditions of Poland the latter function is served mostly by field woods, mid-field water bodies and ditches, and field margins, i.e. non-crop habitats defined in the literature as "marginal habitats" or "environmental islands" (Gamrat, 2012; Wuczyński et al., 2014; Tomaszewska et al., 2016; Ceynowa-Giełdon et al., 2017; Fudali et al., 2020 and literature quoted therein), or recently as elements of "green infrastructure" (European Commission, 2013). Considering accelerating urbanization a question what are changes in the structure and species composition of still existing fragments of agricultural landscape on city peripheries seems worthy to study. Do they retain biological richness or whether they are losing it as a result of urbanization pressure?

Although the processes of suburbanization have been the subject of much research and analysis in recent decades (i.e. Solon, 2009; Wang et al., 2017; Hlaváček et al., 2019 and literature quoted therein) an almost a lack of plant biodiversity research on the existing in the city outskirts fragments of the agricultural landscape is visible, both in the available literature on sustainable urban development and the city biodiversity conservation (i.e. McKinney, 2002; Dearborn & Kark, 2009; Aronson et al., 2017; Lepczyk et al., 2017; Kovarik et al., 2020) and in the available literature considering the agricultural biodiversity as well (Le Coeur et al., 2002; Clergue et al., 2005; Cousins, 2006; Edvardsen et al., 2010; Chappell & Lavalle, 2011; Lindborg et al., 2014). This prompted us to undertake in 2019 a floristic research in the farmlands situated on the Wrocław's outskirts, intensively urbanizing in the last two decades. The first stage concerned field woods due to reported in the literature a strong dependence of the level of biological diversity of agricultural lands on field woods (Orzechowski & Trzcianowska, 2016). The initial results have documented a fairly high species richness of plants and their ecological diversity as well as the presence of protected, endangered and rare species in the region (Fudali et al., 2020, 2021). During field studies some practices that pose a threat to these woods have been observed. That allowed us to formulate some further questions focusing on the problem: how to preserve that biodiversity? That problem seems to be currently significant in a view of a concept of sustainable development and a strategy for the development of green infrastructure in cities (European Commision, 2013). Field woods in agricultural outskirts, even assuming the future building of these areas, could be a great connecting element between the greenery in the city and the semi-natural areas outside and it is worth taking care to preserve them just now, before their biodiversity will be degraded due to future land use transformation.

The aim of the paper was to identify and discuss formulated above problem analyzing results of our research, some published ones and unpublished, and available literature. In particular, the following issues were analyzed: 1) the geographic and topographic characteristics of field woods, 2) evaluation of the role of woods studied for the local biodiversity, 3) the risk factors for the degradation or disappearance of field woods and their biodiversity, 4) the legal regulations concerning the protection of field woods.

2. Study area

Wroclaw area amounts to 293 km^2 and number of inhabitants is about 640,000. The city lies in SW Poland, in a flat area formed by the Odra River and its five tributaries, whose waters occupy about 3% of its area. The climate is transitional, between oceanic and continental. Winters are short (65 days) and mild. The average annual precipitation in the 20th century was 583 mm. The average annual temperature is 9°C, and the annual temperature amplitude is 19.2°C. The most frequent winds are from a western and southern directions (27.6% of days a year; 23.1% respectively) (Lewicki, 2014).

Wrocław was founded in the 12th century and its territorial development was similar to that of many other European cities. From the beginning of the 19th century, adjacent villages were gradually incorporated into the city administrative boundaries. During the Second World War it was in 89% destroyed. Essential changes in its acreage took place in 1951 – then 12 villages and settlements located east and south of the city were attached, and in 1970 – when 14 villages situated north and west of the city were incorporated. Then, more than half of the city's area had agricultural character. Beginning from that time they have been partly fallowed and systematically built-up with residential and housing estates. According to contemporary estimation presently circa 25% of the city area is occupied with the crop fields (Zakrzewska-Półtorak, 2017). The resources of non-build soils that are constantly used for agriculture are unevenly distributed in the city area. Only narrow strips in the southern part of the city occur (the best black lands) and in the eastern (quite fertile, but waterlogged river muds and glial soils) while much larger areas of farmlands are situated in the western (fertile and moist river marshes) and north-western sectors of Wrocław (acidic light soils, weak in terms of agriculture) (Lewicki, 2014).

3. Materials and Methods

The whole-city-area inventory method was used. The selection of the study patches was based on Google Maps aerial photographs and field investigation to check whether the surroundings of patch are still cultivated farmlands and whether these patches are real woods not schrubs. In total, 82 field woods met these both conditions. In the field, there were also recorded comments on the shape of the field wood, its topography, the nearest neighborhood and the structure of the tree stand. On this basis, the author's classification was made into 3 basic types of field woods: P) patches characterized by a compact shape – 34 objects, (LP) elongated patches – 16 and (L) linear forms not exceeding 2–3 m wide – 32.

For the geographic characteristic the following spatial data were used: the Urban Atlas (2018) – European land cover and land use database (https://land.copernicus.eu/local/urban-atlas/urban-atlas-2018) and the national Database of Topographic Objects (BDOT10k), as well as 1-m resolution, LiDAR-based Digital Terrain Model, both provided by the Head Office of Geodesy and Cartography (GUGiK – https://www.gov.pl/web/gugik-en).

First, the geometric features (area, perimeter, shape index) of field woods were analyzed. The shape index is normalized ratio of patch perimeter to area in which the complexity of patch shape is compared to a square of the same size (Turner et al., 2001). It takes the value of 1 with the most compact shape and values greater than 1 as the complexity of its geometry increases. Then, the spatial distribution of field woods was considered along with the analysis of the distribution pattern using the nearest neighbor analysis (R statistics – nearest neighbor index). The values of $R<1$ indicate a clustered distribution, $R>1$ – a dispersed distribution, and values close to 1 (statistically insignificant) indicate a random distribution (Wong & Lee, 2005). Finally, an analysis of the location of field woods was carried out in relation to selected anthropogenic elements – roads, buildings, and natural ones – hydrography, relief. A distance analysis was used for roads, buildings and surface waters. The microscale features of the terrain (elevation and slope inclination) within the woods were compared with those for the adjacent areas (50-meter buffer zones around woodlots) and all arable lands. All spatial analyzes were performed using ArcGIS 10.7 software.

Floristic research was carried out in the growing season of 2019 using the route method by recording all observed species and they abundance using percentage scale. The area within the range of tree crowns (vertical projection) was assumed as the area of a given object. List of the plant species recorded with information of their frequency was provided in Fudali et al. (2021). The potential use of the plants as forage for insects and other animals was defined basing on the available literature (Düll & Kutzelnigg, 2005; Ebert, 1994; Fitter, 1987; Oberdorfer, 2001; Rostafiński & Seidl, 1973; Witt, 1995).

4. Results and Discussion

4.1. Geographical features of field woods

The examined 82 field woods occupy a total of 472,263.8 m², which is 0.87% of the arable land area within Wrocław. It is almost two times less than in agricultural areas adjacent to the city from SW (Orłowski & Nowak, 2005).They showed great variability with regard to surface and shape (Table 1).

The largest total area of 293,506.6 m² (62.2% of the total woods area) is occupied by P forms, then L forms – 105,012.0 m² (22.2%) and LP forms – 73 745.3 m² (15.6%). The P forms, on average, have the greatest area but showed also the greatest variability in this attribute. They have the shortest average circumference what makes that this group is characterized by the smallest shape index and its lowest variability, so that this form type is the most compact. The L forms are characterized by the lowest compactness, with the simultaneous high variability of the shape index (Table 1).

Table 1. Statistics of the area, perimeter and shape index of field woods studied

Form	Min	Max	Mean	Std
	Area [m²]			
ALL	159.63	82055.00	5759.31	10274.32
L	625.76	13245.26	3281.62	3097.05
LP	1161.23	11655.24	4609.08	3087.37
P	159.63	82055.00	8632.55	15292.54
	Perimeter [m]			
ALL	51.29	2217.85	463.07	396.29
L	139.22	2217.85	593.21	516.44
LP	141.18	1074.73	447.01	241.45
P	51.29	1431.29	348.15	288.15
	Shape Index			
ALL	1.06	5.71	2.02	0.98
L	1.44	5.71	2.83	1.03
LP	1.17	3.82	1.90	0.62
P	1.06	1.97	1.33	0.21

The field woods occur only in the far periphery, not more than 2 km from the administrative borders, in the western, northern and eastern parts of the city. They were not found to be on the south side or further into the city (Fig. 1). The lack of comparative data from earlier periods, before the construction boom, leaves considerations of the reasons for such a distribution in the sphere of speculation.

The nearest neighbor analysis shows a statistically significant clustering of the patches, both for the entire set (R = 0.291, p-value = 0.000) and for individual types: L (R = 0.351, p-value = 0.000), LP (R = 0.547, p-value = 0.000) and P (R = 0.411, p-value = 0.000). This means that the woods are closer to each other than would appear from the random process. In fact, they form 6 distinct clusters with more than 2 objects (only 6 objects remain outside of them; (Fig. 1), and the average distance to the nearest neighbor is only 275 m.

The analyzed woods are located at different distances from the road network. Nearly 40% of them are located next to roads or in the vicinity (up to 50 m from the road), and 48% – more than 100 m, of which only 7 sites have this distance greater than 500. In the immediate vicinity of the roads there are mainly forms LP and L. Their average distance from the nearest road is 81 m and 99 m, respectively, while for P-type the average distance is 214 m. Most of the objects (62%) are located more than 500 m from the nearest residential area, and among the remaining 13 are not more than 100 m away. The closest to the buildings are the L and LP forms (on average, respectively: 283 m and 371 m), and the farthest – the P-type (502 m).

The analysis of the location in relation to the hydrographic network of the area showed quite close relationships between woods and surface waters. 46 objects are located above a watercourse, drainage ditch or a water reservoir, and 16 more at a distance of <50 m from them. Only five objects are more than 500 m from any element of the hydrographic network. The relationship with surface waters concerns mainly linear forms – the average distance of L and LP forms from the network is respectively: 33 m and 37 m, with the LP forms closer to the watercourses, and the L forms closer to the drainage ditches. The P-type is the least related to the elements of the hydrographic network – the average distance is 137 m. The presented analyzes lead to the conclusion that the factor contributing to the field woods maintain in the study area is the rich hydrographic network and their distance from residential buildings.

As far as the relief is concerned, the average height in the field woods is not significantly different from that in the surroundings. But the area within the woods is characterized by a greater variability in height as well as a greater slope and variability of this attribute. This applies in particular to linear forms (L and LP; Table 2). In general, it can be concluded that the woods occupy areas of greater height variation, which also results in the occurrence of larger local slopes. Therefore, one cannot reject the thesis that one of the factors contributing to the preservation of field woods may be the

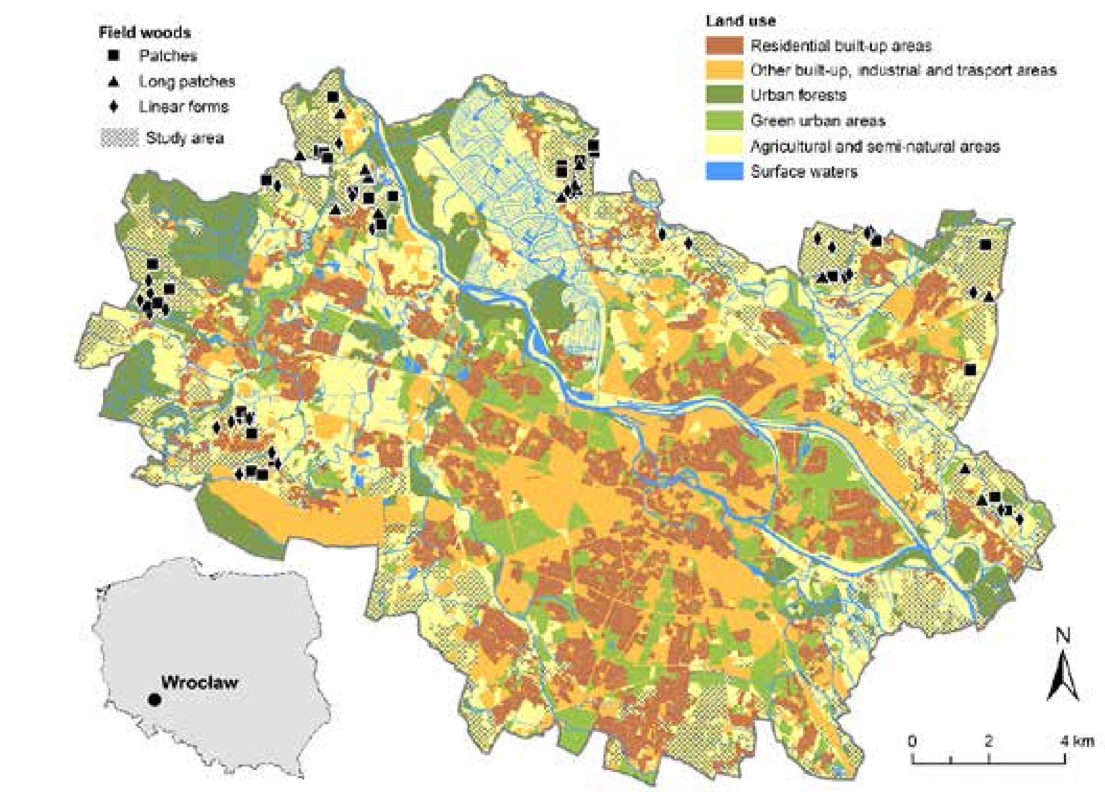

Figure 1. Field woods in the area of Wrocław, Poland in 2019

local height variability, which makes it difficult to carry out agricultural works. Since this mainly concerns linear forms located in the vicinity of watercourses and drainage ditches, it can be assumed that it is largely due to the presence of slopes by watercourses and ditches.

Table 2. Statistics of the height and slope of the terrain within the field woods and in the neighboring areas

Form	Min	Max	Mean	Std
	Elevation [m]			
ALL	108.3	134.8	120.38	9.06
L	108.9	134.4	121.18	7.35
LP	108.3	128.1	113.30	4.17
P	108.4	134.8	121.87	9.66
Buffer 50 m	108.3	134.9	119.34	7.86
Arable land	107.2	139.8	119.36	6.63
	Slope [deg]			
ALL	0.0	45.6	4.79	5.23
L	0.0	40.9	7.24	6.39
LP	0.0	45.6	6.99	6.70
P	0.0	44.8	3.37	3.58
Buffer 50 m	0.0	56.0	2.45	3.08
Arable land	0.0	78.1	2.47	3.51

4.2. The role of field woods in maintaining local biodiversity

In total, in the woodlots studied 403 species of vascular plants and 20 of bryophytes were recorded. A similar level of the vascular plants' species richness in field woods was recorded in typically agricultural regions of Poland: 366 species in 23 sites of the SW Poland (Koszelnik-Leszek et al., 2015), 411 – in 176 woods located in Żuławy (Afranowicz-Cieślak, 2011). It should be noted, however, that these data are not fully comparable due to the different number of sites examined and the size of the area to which they relate.

The studied field woods constitute mainly a reservoir for species of flowering plants, both trees and shrubs (39; 42, respectively) and herbaceous plants (315); while for biodiversity of the remaining taxonomic groups of plants, they seem to be of little importance. As a result of the research, a few representatives of gymnosperms (1), ferns (3), horsetails (3), liverworts (2) and mosses (18) were identified.

Most of the flora found in the studied woods are plants widely distributed in the country, but there were also 3 protected species, 4 endangered species and 3 rare species in the Lower Silesia region (Fudali et al., 2020). The presence of indicator plant species of ancient forests was also found (Fudali et al., 2021). In terms of biodiversity protection in agricultural landscapes, these are the attributes assigned to marginal habitats (e.g. Edvardsen et al., 2010; Wuczyński et al., 2014), including small forest patches (Fudali et al., 2015; Decocq et al., 2016).

The found vascular flora is ecologically diverse in relation to the moisture requirements, e.g. with a clear dominance of mesophytes (58%), 20% of species were hygrophytes and aquatic plants, while 5% – plants of dry habitats (Fudali et al., 2021). So these woods create ecologically diverse habitats, which indicates their potential role as stopping places for the migration of plants with different requirements. At the same time, the identified socio-ecological diversity of the vascular flora showed that some of the studied woods can be considered enclaves of forest species, as well as shrub and meadow species (Fig. 2).

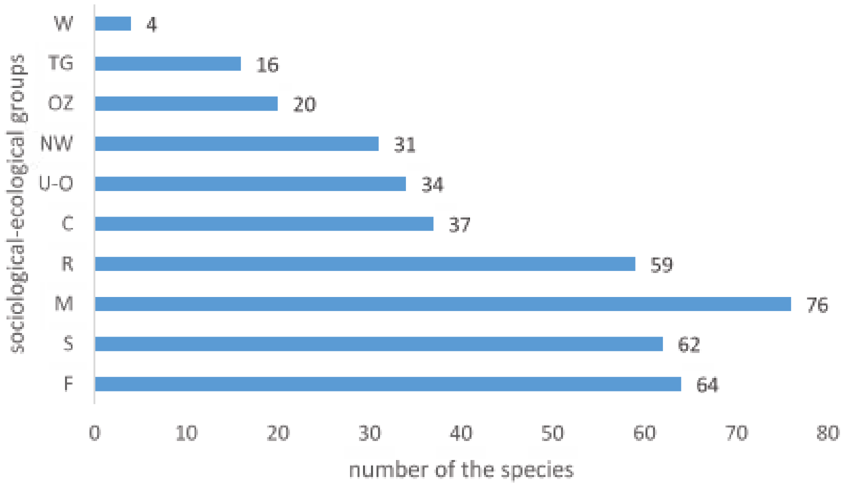

Figure 2. The number of species representing the distinguished sociological-ecological groups in the flora studied. Explanation of symbols: C – plants of segetal communities, F – plants of forest communities, M – meadow plants, TG – plants of termophilic grassland communities, NW – plants of communities developing near water, OZ – communities of the forests' herbal fringes, R – plants of ruderal communities, S – plants of scrub communities, U-O – utility and ornamental plants, W – aquatic communities (according to Fudali et al. (2021), modified)

The species richness of flowering plants affects the biodiversity of pollinating insects (Bates et al., 2011) and herbivores for which they are a food source. It was found that 254 species (63% of the woodlots' flora) can be a nutrients for insects and other animals (Table 3). The role of field woods as places of the animals reproduction and shelter is also important for their biodiversity preservation (Ryszkowski et al., 2003; Decocq et al., 2016).

Table 3. Number of plant species recorded in the studied field woods that potentially constitute food for the listed groups of animals

English and Latin name of taxonomic group of animals	Number of the species
INSECTS – Insecta	202
range: FLIES – Diptera	88
range: BUTTERFLIES – Lepidoptera	94
range: BEETLES – Coleoptera	37
range: FEMALE- Hymenoptera	138
SLUGS – Gastropoda	2
BIRDS – Aves	36
MAMMALS – Mammalia	14

These analyses show that the presence of field woods can have a significant impact on the state of nature resources and biodiversity in a study area what makes them worthy to be preserved. In our opinion, they meet the conditions for city green infrastructure (GI). The definition of "green infrastructure" indicates that the management of these areas is to "protect natural resources and ecosystem services while providing the society with the related benefits", including improving living conditions. The preservation of woods, understood as a natural habitat, and not only a collection of trees, may have a beneficial effect both for further located agricultural areas, because, as has been shown, they are sources of dispersion of various organisms, including pollinating insects and predators of herbivorous insects, as well as for urban greenery. As our research has shown, two sociological-ecological groups of plants were particularly richly represented in field woods studied: meadow plants and forest and shrub plants. The same groups of plants build, to a large extent, spontaneous greenery in cities (Wittig, 1995). Therefore, the studied objects may to serve as connecting elements for the migration of these species between semi-natural ecosystems located outside the city and the built-up area, thus affecting the good functioning of its green infrastructure. Of course, on condition that the habitat is kept in good condition. Therefore, it seems justified to postulate that the marginal habitats occurring in the agricultural outskirts of the cities, especially field woods, should be included in one system of green infrastructure development activities.

4.3. Threats to biodiversity of field woods flora

Most of the species (85%) occurred in a few locations and 23% of them in only one (Fig. 3), most often in poorly numerous populations (5–30 individuals). These are features that indicate a real threat of extinction in the studied area.

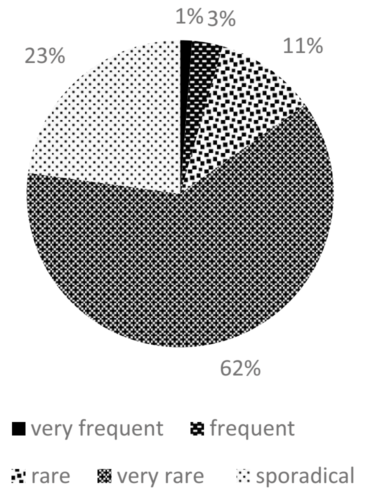

Figure 3. Percentage incidence of the species in the classes of relative frequency defined. Key: Very frequent – the species was present in at least 75% of the sites, Frequent – 50–74.9%, Rare – 25–49.9%, Very rare – in less than 25% of the sites but in at least 2; Sporadical – species recorded only in 1 site (according to Fudali et al. (2021), modified)

In such a changed landscape as the agricultural landscape, the low population size of many species can be the effect of strong fragmentation of natural biocenoses (Decocq et al., 2016). The creation of green connections between isolated patches of field woods can slow down their biodiversity loss (Pullin, 2002).

But during the field research some additional traces of human activities, causing physical and sometimes chemical destruction of the habitat and plants were also observed. These include, first of all, the frequent use of P-type woods (65% of all woods of this type) and those accompanying ditches (42%) as illegal landfills of large-size household waste (used furniture, washing machines, refrigerators), also used tires, parts of agricultural equipment, packaging for plant protection products and construction debris. Weeds and unused parts of garden crops were also left in there quite often. In many cases, the edges of the field woods were plowed up, and plant damage inside due to spraying with herbicides were also observed. In some P-type objects, traces of burning a fire and cutting bushes were found. These practices were also reported from typical agricultural areas (Gamrat, 2012).

How to ensured protection against devastation? That can be achieved by engaging specialized services or by providing financial incentives for local residents. Such a financial support should be associated with the obligation to care for the maintenance of the proper condition of these habitats. In Polish conditions, this care should primarily concern not allowing waste disposal in them. So far, illegal storage of waste in forests, mid-field groves or roadside ditches, both by local people and those bringing it from other areas, is still an unsolved problem on a country scale.

Educational activities are also needed among the inhabitants of the periphery, because the destruction of woods most often results from the belief that these vegetation deplete the soil and take away water from crop plants, as well as that they are a place where crop pests develop.

When discussing the threats for preservation of local plant biodiversity, it should be noted that field woods can play negative role as places of settlement and spread for many alien plant species, including invasive ones (Decocq et al., 2016). Their source may be populations located in the vicinity, but also bio-waste thrown from gardens and fields, containing vegetative parts of these plants, as well intentional introductions. During studies the presence of 46 aliens was found, including 22 trees or shrubs (27% of all from this group) and 24 herbaceous species (7%). Such a significant share of alien trees and shrubs (from 22% to as much as 60%) in the field woods was also noted in other regions of Poland (Fenyk et al., 2010; Afranowicz-Cieślak, 2011). However, although the aliens incidence was 11% of the found flora, only three of them can now be considered as really expansive: *Solidago gigantea* (recorded in 82% of the sites), *Impatiens parviflora* (56%) and *Padus serotina* (49%). Most aliens (72%) were found in no more than 5 objects.

4.4. The legal status of the field woods biodiversity protection

General rules regarding the prohibition of the removal and destruction of trees and woods, both mid-field, road and water ones, with some exceptions to this provision, are included in two acts on nature protection and environmental protection (L1, L2). The implementation of these provisions has been assigned to communes as the basic territorial units in the Polish administrative system (L3). Also in the national strategic documents the importance of green infrastructure (and thus also woods) and obligation to actions for its protection and development are pointed in many places (L4).

But the authors dealing with the implementation of the policy of field woods in the country point to the lack of executive regulations (Orzechowski & Trzcianowska, 2016 and the literature quoted therein). Among others there is no legal definition of field woods, which results in an excessive amount of interpretation what is and what is not a field wood; there is no indication of the method of marking the field woods in the land register, which means that not all of them are recorded in the spatial development plans or in the decisions on building conditions. Moreover, there is no obligation to make an inventory of field tree stands; uniform management principles are not formulated; there is no indication of specific institutions and entities responsible for their protection. It is the commune councils that set the environmental protection tasks in their area. In practice, therefore, the protection of field woods is most often limited to the control of permits for felling trees. Since illegal removing trees is associated with a high cash penalty, woods are protected in this respect. But, their habitats, which host a high diversity of flora and fauna are not a subject of protection.

In the current national legal order, especially valuable field woods and their habitat may be under individual protection in the form of „ecological land" (L1). This form of protection does not limit economic activities around the object protected but it strengthens the sanctions for destruction, because "damage to ecological land is the same as damage to the environment so it requires preventive, remedial and compensation measures". It also introduces the obligation to include ecological land in local spatial development documents and agreeing decisions on building conditions and land development regarding that object with the proper institution, responsible for the application of the provisions of (L1). Establishing an ecological land is within the competence of the commune council, but requires the preparation of appropriate documentation. Municipalities are not obliged to perform latter tasks.

5. Conclusions

Today, sustainable development is a recognized idea of thinking about the future, present in many documents and declarations of politicians. One of the necessary condition for such development is maintaining and developing environmental resources. In any type of the agricultural landscape marginal habitats can influence biodiversity, acting as a refuge for plants and animals, both rare and common, and as places of organisms dispersion (Le Coeur et al., 2002; Cousins, 2006; Edvardsen et al., 2010; Gamrat, 2012; Lindborg et al., 2014). Our research has shown that a similar role is still played by field woods in the agricultural outskirts of Wrocław. Therefore, they fulfill one of the basic functions assigned to green infrastructure (European Commission, 2013).

However, there is no comparative data available from other cities what currently makes the problem of the field woods' biodiversity in the city outskirts and its preservation rather theoretical. Why are fragments of agroecosystems within the range of expanding cities so rarely studied in terms of biodiversity? Perhaps this is due to the assumed temporary character of these areas, as urban development plans often include the goal of eliminating agricultural suburbs and fully housing them. The loss of arable land in the vicinity of cities is observed on all continents (Paül & McKenzie, 2012).

But not all sites in the peripheries are attractive to developers due to topographic or hydrological conditions, and agricultural land use is often maintained there. For example, our analyzes have shown a strong relationship between the woods studied and the hydrographic network. It can therefore be assumed that small agricultural enclaves will still exist on the outskirts of the cities. So, their natural resources should be properly managed. The presented analysis of the field woods' legal status in Poland has shown many formal gaps in this respect, what makes their preservation uncertain.

However, in the context of managing natural resources, the question whether all objects should be kept in their current state arises. The postulates concerning the protection of biodiversity refer to the native flora (Alvey, 2006; McKinney, 2006) and our research has shown the heterogeneity of the flora of field woods in terms of its origin. So should incoming alien species be systematically removed from field woods?

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