

Diversity of flora in historical parks on example of Sokolow Podlaski Region in Poland

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Abstract

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The paper is focused on diversity of flora in historical parks on example of Sokolow Podlaski Region. The research was done in 20 historical parks. Parks were established in XVIII–XIX centuries (landscape historic style) on oak-hornbeam habitat. Nowadays these parks are without anthropic pressure since II World War. The methodology included two research stages: field research and indoor studies. Research assumed flora and syntaxonomic analysis. The field research was done in years 2010–2012, including 70 phytosociological records on the area 500 m². Plant species are represented by natural, semi-natural and synantropical vegetation. There was observed impact for migration species from surroundings areas in study areas.

Keywords

flora, historical parks, oak-hornbeam habitat, Sokolow Podlaski Region

Introduction

Agricultural landscape is as a ‘sea’ with ‘green islands’ (BUČEK et al., 1996). Manor parks are sometimes the last sites for existing forest plants in agricultural landscape (OLACZEK, 1972). Many plants and animal species typical for agricultural landscape are rare and on the verge of extinction (ROBINSON and SUTHERLAND, 2002; HERMY and STIEPERAERE, 1981). Studies concerning historical parks mostly include issues related to a dendrological inventory, the history of the manor parks’ ownerships, objects’ condition and parks’ cultural values and functions alongside with a proposal of their protection and restoration. There are no many studies about flora in these objects. The aim of the study is diversity of flora in historical parks on example of Sokolow Podlaski Region.

Material and methods

Sokolow Podlaski Region (137.18 km² surface) is located on east part of Poland. This area belongs to Ma-

zowiecko-Poleski section according to MATUSZKIEWICZ (1993).

The research was done in 20 historical parks in Sokolow Podlaski Region (Fig. 1). Parks were established in XVIII and XIX centuries (landscape historic style) on oak-hornbeam site.



Fig 1. Location of study area.

The methodology included two research stages: field research and indoor studies. The field research was done in years 2009–2011. 70 phytosociological records on the area 500 m² (BRAUN-BLANQUET, 1964) were done on afforested areas of parks. Plant species were grouped by phytosociological system following MATUSZKIEWICZ (2001). The next stage of work was vegetation evaluation

of manor parks. Vegetation evaluation included 11 criteria as number of tree species in tree layer, origin of trees, types of plantings, tree-covered areas (%), health of plantings, number of shrub species, origin of shrubs, shrub-covered areas (%), number of herb species, origin of herb species, herb-covered areas (%) and bonitation from 0 to 3 points (Table 2). Parks were grouped

Table 1. Vegetation evaluation of historical parks

Criteria		Bonitation points
Tree layer		
Number of tree species	Above 6 tree species	3
	4–5 tree species	2
	1–3 tree species	1
Origin of trees (dominated in park)	n – native species	3
	c – cultivator species (planted trees)	2
	ex–exotic species (introduced artificial)	1
Types of plantings	Avenues, group of trees, individual trees	3
	Group of trees, individual trees	2
	Only group of trees	1
Tree-covered areas [%]	Above 50%	3
	25%–50%	2
	1%–24%	1
Health of plantings	Good (mostly without canopy losses, tree hollows, diseases)	3
	Medium (sometimes with canopy losses, tree hollows, diseases)	2
	Bad (many canopy losses, tree hollows, diseases)	1
Shrub layer		
Number of shrub species	Above 6 plant species	3
	4–5 plant species	2
	1–3 plant species	1
Origin of shrubs (dominated in park)	n – native species	3
	c – cultivator species (planted shrubs)	2
	ex–exotic species (introduced artificial)	1
Shrub-covered areas [%]	Above 50%	3
	25%–50%	2
	1%–24%	1
Herb layer		
Number of herb species	Above 6 plant species	3
	4–5 plant species	2
	1–3 plant species	1
Origin of herb species (dominated in park)	n – native species (apophytes, spontanophytes)	3
	c – alien species (antropophytes)	1
Herb-covered areas [%]	Above 50%	3
	25%–50%	2
	0%–24%	1

into four groups: parks with high vegetation values (from 25 to 33 points), parks with medium vegetation values (from 18 to 24 points), parks with low vegetation values (from 8 to 17 points) and parks with very low vegetation values (from 0 to 7 points) (Table 1).

Table 2. Plant species in tree layer in manor parks in Sokolow Podlaski Region

Latin name	Syntaxonomic class
<i>Acer campestre</i> L.	Querco-Fagetea
<i>Acer platanoides</i> L.	Querco-Fagetea
<i>Acer pseudoplatanus</i> L.	Querco-Fagetea
<i>Acer pseudoplatanus</i> <i>Atropurpureum</i> L.	Companion species
<i>Aesculus hippocastanum</i> L.	Companion species
<i>Alnus glutinosa</i> L.	Salicetea purpureae
<i>Betula pendula</i> Roth.	Companion species
<i>Carpinus betulus</i> L.	Querco-Fagetea
<i>Corylus avellana</i> L.	Querco-Fagetea
<i>Euonymus verrucosa</i> Scop.	Querco-Fagetea
<i>Fagus sylvatica</i> L.	Querco-Fagetea
<i>Fraxinus excelsior</i> L.	Querco-Fagetea
<i>Malus domestica</i> Borkh.	Companion species
<i>Padus avium</i> Mill.	Querco-Fagetea
<i>Populus alba</i> L.	Salicetea purpureae
<i>Prunus avium</i> (L.) Moench.	Querco-Fagetea
<i>Prunus domestica</i> L.	Companion species
<i>Prunus mahaleb</i> (L.) Mill	Companion species
<i>Quercus robur</i> L.	Companion species
<i>Quercus rubra</i> L.	Companion species
<i>Robinia pseudoacacia</i> L.	Companion species
<i>Sambucus nigra</i> L.	Epilobietea angustifolii
<i>Tilia cordata</i> Mill.	Querco-Fagetea
<i>Ulmus laevis</i> Pall.	Querco-Fagetea

Results and discussion

Plant species recognized in manor parks were represented by 7 plant communities of eutrophic forest community (Querco-Fagetea), riparian forest and brush of river valley (Salicetea purpureae) coniferous forest communities (Vaccinio-Piceetea), cut-over communities (Epilobietea angustifolii), bush communities (Rhamno-Prunetea), meadow and pasture communities (Molinio-Arrhenatheretea), margin communities, ruderal communities (Artemisietea vulgaris) and companion plant species (Tables 2–4). There have occurred plant species from all 3 syntaxonomic classes in tree layer. In shrub, there were distinguished plant species from 5 plant communities and 6 plant communities in herb layer.

Table 3. Plant species in shrub layer in historical parks in Sokolow Podlaski Region

Latin name	Syntaxonomic class
<i>Abies alba</i> Mill.	Vaccinio-Piceetea
<i>Acer campestre</i> L.	Querco-Fagetea
<i>Acer platanoides</i> L.	Querco-Fagetea
<i>Acer pseudoplatanus</i> L.	Querco-Fagetea
<i>Aesculus hippocastanum</i> L.	Companion species
<i>Betula pendula</i> Roth	Epilobietea angustifolii
<i>Carpinus betulus</i> L.	Querco-Fagetea
<i>Corylus avellana</i> L.	Querco-Fagetea
<i>Crataegus monogyna</i> Jacq.	Rhamno-Prunetea
<i>Euonymus verrucosa</i> Scop.	Querco-Fagetea
<i>Fagus sylvatica</i> L.	Querco-Fagetea
<i>Fraxinus excelsior</i> L.	Querco-Fagetea
<i>Padus avium</i> Mill.	Querco-Fagetea
<i>Philadelphus coronarius</i> L.	Companion species
<i>Populus alba</i> L.	Salicetea purpureae
<i>Quercus robur</i> L.	Companion species
<i>Ribes rubrum</i> L.	Companion species
<i>Robinia pseudoacacia</i> L.	Companion species
<i>Rubus idaeus</i> L.	Epilobietea angustifolii
<i>Sambucus nigra</i> L.	Epilobietea angustifolii
<i>Sorbus aucuparia</i> L.	Companion species
<i>Syringa vulgaris</i> L.	Companion species
<i>Taxus baccata</i> L.	Companion species
<i>Thuja occidentalis</i> L.	Companion species
<i>Tilia cordata</i> Mill.	Querco-Fagetea
<i>Ulmus laevis</i> Pall.	Querco-Fagetea

Table 4. Plant species in herb layer in historical parks in Sokolow Podlaski Region

Latin name	Syntaxonomic class
<i>Acer platanoides</i> L.	Querco-Fagetea
<i>Acer pseudoplatanus</i> L.	Querco-Fagetea
<i>Aegopodium podagraria</i> L.	Querco-Fagetea
<i>Aesculus hippocastanum</i> L.	Companion species
<i>Ajuga reptans</i> L.	Companion species
<i>Allium ursinum</i> L.	Querco-Fagetea
<i>Anemone nemerosa</i> L.	Querco-Fagetea
<i>Anemone ranunculoides</i> L.	Querco-Fagetea
<i>Asarum europaeum</i> L.	Querco-Fagetea
<i>Carex pilosa</i> Scop.	Querco-Fagetea
<i>Carex umbrosa</i> L.	Querco-Fagetea
<i>Carpinus betulus</i> L.	Querco-Fagetea
<i>Cerastium sylvaticum</i> Waldst. & Kit	Artemisietea vulgaris
<i>Chelidonium majus</i> L.	Artemisietea vulgaris

<i>Convallaria maialis</i> L.	Companion species
<i>Corydalis cava</i> L.	Querco-Fagetea
<i>Corylus avellana</i> L.	Querco-Fagetea
<i>Dactylis glomerata</i> L.	Molinio-Arrhenatheretea
<i>Dactylis polygama</i> Horv	Querco-Fagetea
<i>Euonymus verrucosa</i> Scop	Querco-Fagetea
<i>Fagus sylvatica</i> L.	Querco-Fagetea
<i>Ficaria verna</i> Huds.	Querco-Fagetea
<i>Fragaria vesca</i> L.	Epilobietea angustifolii
<i>Gagea lutea</i> L.	Querco-Fagetea
<i>Galeobdolon luteum</i> Huds.	Querco-Fagetea
<i>Galium schultesii</i> L.	Querco-Fagetea
<i>Galium sylvaticum</i> L.	Artemisietea vulgaris
<i>Geum urbanum</i> L.	Artemisietea vulgaris
<i>Glechoma hederacea</i> L.	Artemisietea vulgaris
<i>Hedera helix</i> L.	Companion species
<i>Impatiens noli-tangere</i> L.	Querco-Fagetea
<i>Impatiens parviflora</i> L.	Artemisietea vulgaris
<i>Lamium album</i> L.	Artemisietea vulgaris
<i>Lamium maculatum</i> L.	Artemisietea vulgaris
<i>Lamium purpureum</i> L.	Artemisietea vulgaris
<i>Lathyrus vernus</i> (L.) Bernh.	Querco-Fagetea
<i>Luzula pilosa</i> (L.) Willd.	Companion species
<i>Lysimachia nummularia</i> L.	Molinio-Arrhenatheretea
<i>Maianthemum bifolium</i> (L.) Schmidt	Companion species
<i>Milium effusum</i> L.	Querco-Fagetea
<i>Oxalis acetosella</i> L.	Companion species
<i>Plantago major</i> L.	Molinio-Arrhenatheretea
<i>Poa nemoralis</i> L.	Querco-Fagetea
<i>Polygonatum multiflorum</i> L.	Querco-Fagetea
<i>Prunella vulgaris</i> L.	Molinio-Arrhenatheretea
<i>Prunus avium</i> L.	Querco-Fagetea
<i>Pulmonaria officinalis</i> L.	Querco-Fagetea
<i>Quercus robur</i> L.	Companion species
<i>Robinia pseudoacacia</i> L.	Companion species
<i>Rubus caesius</i> L.	Rhamno-Prunetea
<i>Sambucus nigra</i> L.	Epilobietea angustifolii
<i>Scilla bifolia</i> L.	Querco-Fagetea
<i>Sorbus aucuparia</i> L.	Companion species
<i>Stachys sylvatica</i> L.	Querco-Fagetea
<i>Stellaria holostea</i> L.	Querco-Fagetea
<i>Taraxacum officinale</i> L.	Molinio-Arrhenatheretea
<i>Tilia cordata</i> L.	Querco-Fagetea
<i>Trientalis europaea</i> L.	Vaccinio-Piceetea
<i>Urtica dioica</i> L.	Artemisietea vulgaris
<i>Vinca minor</i> L.	Querco-Fagetea
<i>Viola mirabilis</i> L.	Companion species

Most of the species were represented by the community from eutrophic forest community (Querco-Fagetea) in all layers (tree layer – 55%, shrub layer – 40% and herb layer – 55%). Percentage of cover plant species from Rhamno-Prunetea and Vaccinio-Piceetea classes was not very high in all parks (Figs 2–4).

There were distinguished many native plant species such as: *Acer pseudoplatanus*, *Carpinus betulus*, *Fagus sylvatica*, *Euonymus verrucosa*, *Corylus avellana*, *Galeobdolon luteum*.

Plant species of eutrophic forest community like: *Carpinus betulus*, *Milium effusum* which are typical for oak-hornbeam habitat. *Tilia cordata*, *Fraxinus excelsior*, *Anemone nemerosa*, *Gagea lutea*, *Galeobdolon luteum*, *Corydalis cava*, dominated in all parks. Plant species from Epilobietea angustifolii class are represented by: *Sambucus nigra*, *Betula pendula* and *Rubus idaeus*. Percentage of cover plant species from Rhamno-Prunetea and the other synthaxonomic classes was not very high in all parks.

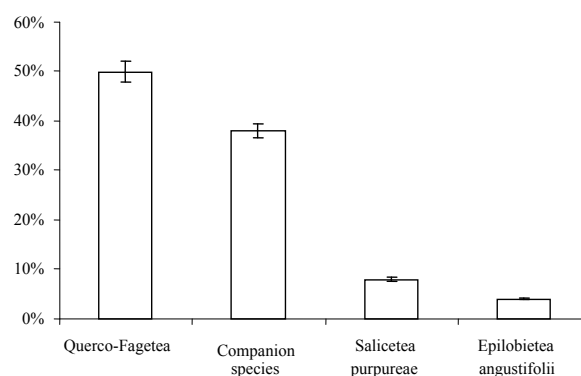


Fig. 2. Percentage cover of plant species in different synthaxonomic unities in tree layer in historical parks.

Vegetation evaluation included eleven criteria: number of plant species in tree layer, origin of trees, types of plantings, tree-covered areas, health of plantings, number of plant species in shrub layer, origin of shrubs, shrub covered areas, number of plant species in herb layer, origin of herbs, herb covered areas (Table 5).

High diversity of native plant species in tree, shrub and herb layer was observed in the park objects. Individual trees and groups of trees were typical plantings on study parks. Eight parks with high vegetation values and twelve parks with medium vegetation values were distinguished.

Flora of manor parks is still modified by human and nature processes (SIKORSKI and WYSOCKI, 2003). Woody plant species were noticed in parks by many scientists e.g. DZWONKO and LOSTER (2001), FORMAL-PIENIAK and WYSOCKI (2006, 2009). Plants from Querco-Fagetea occur in Sandomierska Basin park's herb layer (FORMAL-PIENIAK, 2007) and Sokolow Podlaski Region. There were also observed plant species from Molinio-Arrhenatheretea and Trifolio-Geranietea sanguinei.

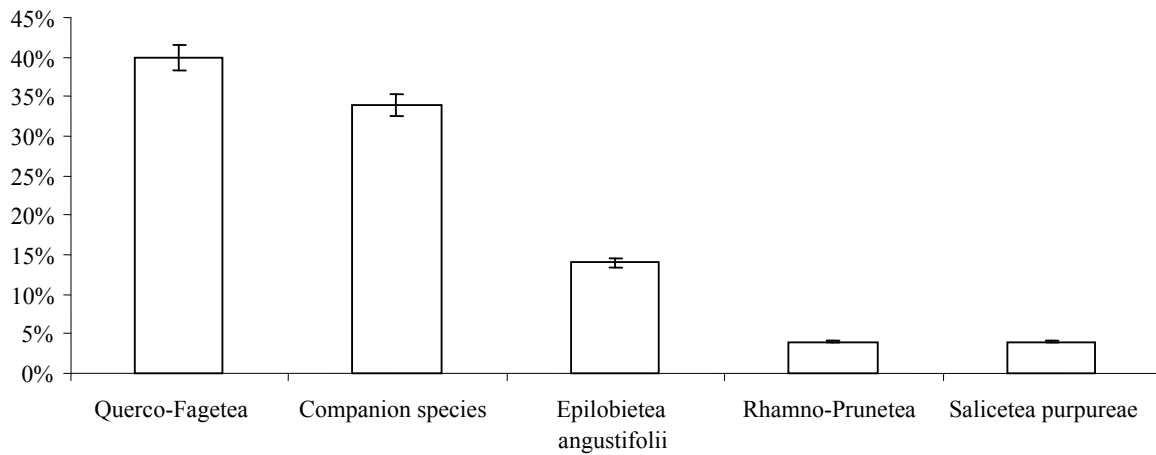


Fig 3. Percentage cover of plant species in different syntaxonomic unities in shrub layer in historical parks.

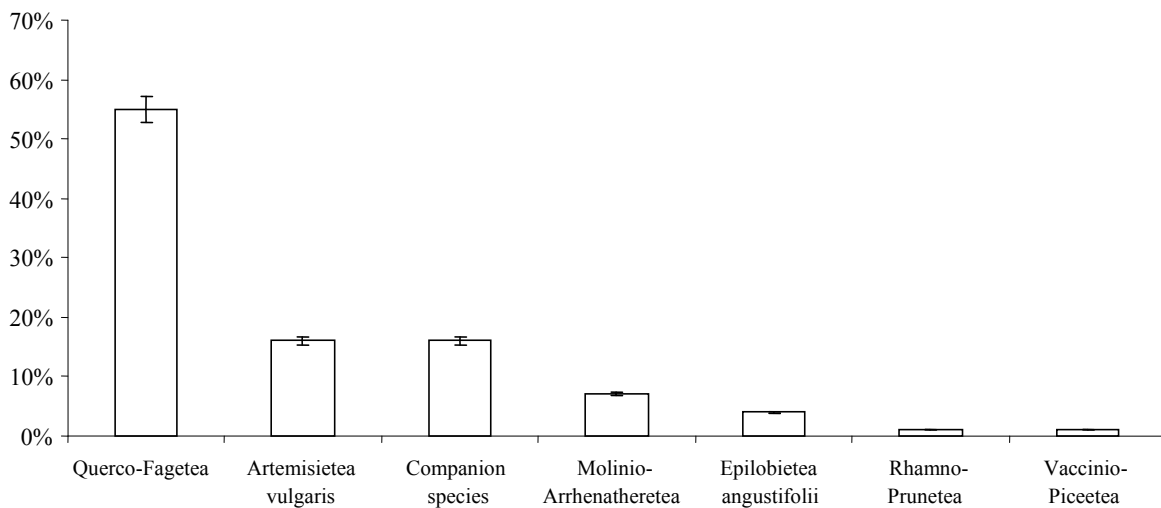


Fig 4. Percentage cover of plant species in different syntaxonomic unities in herb layer in historical parks.

Table 5. Planting evaluation of manor parks in Sokolow Podlaski Region

Criteria/number of parks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A Tree layer																				
Number of plant species	2	2	2	1	3	2	2	3	2	3	2	2	2	2	2	3	2	3	2	3
Origin of trees (dominated)	1	2	3	1	3	1	1	1	2	3	3	2	2	1	2	1	2	3	1	1
Types of plantings	2	3	1	2	3	3	2	1	2	3	3	2	2	2	3	1	2	3	2	1
Tree-covered areas	2	2	2	2	3	3	2	2	2	3	3	2	2	2	2	2	2	3	1	1
Health of plantings	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Sum	9	11	10	8	14	13	9	9	10	14	13	10	10	9	11	9	10	14	8	8
B Shrub layer																				
Number of plant species	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
Origin of shrubs (dominated)	3	2	2	2	3	2	3	2	2	3	3	3	3	3	3	3	3	3	3	3
Shrub covered areas	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Sum	6	5	5	4	6	6	4	4	5	6	6	6	6	6	6	6	6	6	6	6
C Herb layer																				
Number of plant species	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3	3	3	3	3
Origin of herbs (dominated)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Herb covered areas	3	3	2	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	2	3
Sum	9	9	8	9	9	8	8	9	9	9	9	9	9	9	9	9	9	9	8	9
Sum A + B + C	24	25	23	21	29	27	21	22	23	29	28	25	25	24	26	24	25	28	23	23

33–25 points: parks with high vegetation values; 24–18 points: parks with medium vegetation values; 17–8 points: parks with low vegetation values; 7–0 points: parks with very low vegetation values.

Nowadays we have very little information about condition of vegetation in historical parks in Poland. Many dendrological field researches were done but without list of plant species in herb layer. This pilot study is to show the vegetation evaluation diversity of historical parks in Sokolow Podlaski Region in Poland.

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