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THE VASCULAR PLANT SPECIES OF DIFFERENT PROTECTION LEVELS IN THE ECOSYSTEMS OF THE REGIONAL LANDSCAPE PARKS OF THE UKRAINIAN POLISSIA

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The Ukrainian Polissia is a distinctive region in terms of biodiversity, with a significant number of northern and boreal species and communities, as well as Central European species in the Western Polissia. The research region stretches from west to east for 750 km, and from north to south for 120–150 km. In the northeast direction, its territory gradually narrows to 50–80 km and constitutes a significant part of the important ecological corridor of Eastern Europe.

Background. The natural conditions of the Ukrainian Polissia are favorable for the formation of coniferous, broadleaf and mixed forests, which are zonal communities here. The widespread distribution of fluvioglacial sediments causes the predominance of sandy sod-podzolic soils and associated pine forests. The high groundwater table and the low surface area contribute to the development of eutrophic peat bogs. All this leads to the formation of a diverse vegetation cover, which contributes to the representativeness and significant preservation of floristic and coenotic diversity. One of the key roles in the protection of rare species of phytodiversity in the Polissia region of Ukraine belongs to multifunctional protected areas, including the category of “regional landscape parks”. They cover more than 200 species of vascular plants of the Polissia region, with different conservation statuses – from the international level of protection to the regional one.

Materials and Methods. The study was conducted using conventional field (route-based, geobotanical descriptions of key areas) and desk methods. The species names are given according to the International Plant Names Index, and their belonging to the protected categories is based on the conservation criteria and protection levels according to the regulatory documents.



Results and Discussion. The materials of the research of phytodiversity of five regional landscape parks (Prypiat-Stokhid, Nadsluchanskyi, Ptashynny Rai, Mizhrichenskyi, Yalivshchyna), in particular rare species, are presented, as evidenced by their diversity, including a number of glacial relics, endemics and borderline species located at the southern or eastern border of the distribution area.

Conclusions. The study has revealed that the rare vascular plant flora of the Polissia regional landscape parks is represented by 56 species included in the Red Data Book of Ukraine, 145 species under regional protection of three oblasts of the Polissia region, nine species from Appendix I of the Bern Convention, four species from Appendix II of CITES, and three species included in the European Red List. Two RLPs are the most zoologically representative in the study area: Nadsluchansky (six species of international protection statuses, 30 species of the Red Data Book of Ukraine, 107 species of regional protection level) and Mizhrichynsky (14 species with international protection statuses, 28 species of the Red Data Book of Ukraine, 51 species of regional protection level), which is determined by the peculiarity of natural conditions, habitat diversity and area of the territories. regional landscape parks as a category of nature reserve fund of regional status within the Polissia region of Ukraine cover most of the representative habitats, which include a corresponding number of rare species of different levels of protection, namely: forest (87 species), herbaceous (85 species), marsh (36 species) and aquatic (30 species) habitats.

Keywords: Ukrainian Polissia, regional landscape parks, phytodiversity, vascular plants, internationally protected species, Red Data Book of Ukraine, regional protected species

INTRODUCTION

In Ukraine, the protection of rare and endangered plant species is a pressing issue due to anthropogenic degradation of natural ecosystems. The protection of rare vascular plant species is one of the most pressing scientific and socially important issues. The main method of protecting rare plant species is to reserve areas where populations of such plants grow.

The nature reserve fund of Ukraine includes 11 categories, different statuses, and functions. While the main goal of nature and biosphere reserves is to preserve biotic and landscape diversity, national nature parks and regional landscape parks (hereinafter referred to as RLPs) are assigned several functions other than biodiversity and landscape protection, such as environmental, educational, recreational and other (On the Nature..., 2024).

In this regard, in many industrialized countries a new category of protected areas – nature parks with a focus on recreation – need to be established. Such parks should draw visitors' attention away from the particularly valuable scientific and natural values of national parks and meet the growing recreational needs of visitors.

In the context of developing a network of nature parks in Ukraine, it is important to take into account that, with the exception of the Carpathians, Crimea and Polissia, there are no significant continuous areas of forests suitable for the creation of large nature parks. The concept of regional nature parks as a new format of territorial protection was first emphasized by K. I. Gerenchuk and S. M. Stoyko in 1976 (Gerenchuk & Stoyko, 1976). Scientists hold an opinion that it is necessary to create small but significant in

terms of regional importance natural parks, including ones for the protection of biodiversity (Andrienko *et al.*, 2001).

A significant contribution to the study and protection of the biodiversity of the Ukrainian Polissia was made by T. L. Andrienko, who headed the Interagency Integrated Laboratory of Scientific Basis of Nature Reserve Management of the National Academy of Sciences of Ukraine and the Ministry of Ecology and Natural Resources in 1991. The Laboratory made a substantial contribution to creating an optimal network of protected areas and objects; it promoted the development of strategies for biodiversity conservation, protection regimes, inventory of biota of protected areas of Ukraine, including the study of regional landscape parks (Andrienko *et al.*, 2007).

The category of “regional landscape park” (RLP) was introduced by the Law of Ukraine “On the Nature Reserve Fund of Ukraine” in 1992. The peculiarity of regional landscape parks is that they pursue a combined goal of implementing conservation and rational environmental measures in valuable natural areas, preserving historical and cultural objects, and promoting recreational activities. It is in this category that the two lines of protection converge – the protection of natural complexes as well as historical and cultural sites (On the Nature..., 2024).

In modern conditions, RLPs are an important component of one of the main eco-networking nodes at the regional level, so the development of the system of these territories is one of the main priorities of the state environmental policy, as evidenced by the Decree of the President of Ukraine of 23.05.2005 No 838/2005 “On Measures for the Further Development of Nature Reserve Management in Ukraine” (On Measures..., 2005), Law of Ukraine “On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030” of 28.02.2019 No 2697-VIII and other regulatory documents (About..., 2019).

However, the functioning of regional landscape parks can be problematic in terms of protecting natural ecosystems, unique natural areas, biodiversity, landscapes and rare species at the regional level. Based on European experience of conserving phytodiversity in nature parks, we can identify two groups of factors that negatively affect populations of rare protected plant species, even within the network of protected areas: global and local ones.

The most important global factors that affect the life activities of different groups of rare plants include climate changes that can transform species habitats. Local threats pose a greater danger and risk to the existence of rare species populations. They are divided into direct threats, leading to a direct destruction of rare plant species and indirect threats, when the ecological and phytocoenotic environment in the habitats of rare species changes unfavorably due to natural causes or anthropogenic impacts. These processes have become particularly noticeable since the mid-20th century and continue at a significant pace today.

Due to the fact that a significant part of the Polissia RLPs is under human influence, the issue of conservation of rare plants growing in their territories arises. The study of the bioecology of protected species is important for identifying natural and anthropogenic factors that will contribute to their population plasticity and conservation in natural ecosystems and developing recommendations for their protection and rational use within the study area.

The purpose of the article is to systematize the study of rare species of vascular plants of different levels of protection that are represented in the territories of regional

landscape parks of the Ukrainian Polissia as potential objects of the regional status of conservation of phytodiversity within the study areas.

MATERIALS AND METHODS

The Ukrainian Polissia is a physical and geographical region in the Polissia Lowland, whose location is determined relative to the Dnipro River. Within Ukraine, it is divided into the Right-Bank and the Left-Bank Polissia.

The Polissia wetland region is the largest in mainland Europe, located in the north of Ukraine, stretching from west to east for a distance of 750 km. It is an area that stretches in a strip almost 100 kilometers wide, from the northwestern to the northeastern biogeographic borders of Ukraine (Andrienko *et al.*, 2001). The area of this territory reaches 113,000 km², which is 19 % of the total area of the country. Ukrainian Polissia covers a large area of Volyn, Rivne, Zhytomyr, and Chernihiv regions, and is partially located in Sumy, Kyiv, and Khmelnytskyi regions. On the territory of Ukraine, 14 % of the Polissia area is occupied by newly created multifunctional nature reserves, the largest part of which is located in the Pripyat River basin (Andrienko *et al.*, 2001).

Within the framework of the implementation of the Law of Ukraine “On the Nature Reserve Fund of Ukraine” (On the Nature..., 2024) and the Program for the Prospective Development of Nature Reserves in Ukraine (“Reserves”) (On the Program..., 1994), the stage of further development and optimization of the network of protected areas began in Polissia, in particular, five parks were created: Prypiat-Stokhid (1995), Nadsluchanskyi (2000), Mizhrichenskyi (2002), Yalivshchyna (2014) and Ptashynny Rai (2017).

The methods of the study were selected with a view to determining the current composition of rare phytodiversity in the territory of parks, both existing (2 with administration) and projected (3 without administration). Thus, the research is based on a critical synthesis of original field research data and published materials on rare phytodiversity in the territories of the Polissia RLPs of Ukraine.

The research was conducted using conventional field (route-based, geobotanical descriptions of key areas) and desk methods. The species names are given according to the International Plant Names Index (IPNI) (International Plant... 2024), and their belonging to the protection categories is based on the conservation criteria and protection levels.

Given the still insufficient study of the flora of the RLP territories of this region as a whole, it can be assumed that complete lists of the flora will be formed in the future. The lists of rare species of different levels of protection compiled and presented by us cover the vast majority of species representing the rare component of the phytobiota.

RESULTS AND DISCUSSION

The diversity of physical and geographical conditions, especially the mosaic of relief and soil and hydrological conditions, as well as the considerable length of the Polissia strip from west to east, are the basis for the considerable diversity and variegation of the vegetation cover of Ukrainian Polissia. The absence of large areas of homogeneous vegetation and the complexity of the vegetation cover is a feature of this region, as well as a considerable degree of preservation of natural vegetation.

The diverse natural ecosystems of the Polissia region of Ukraine are characterized by rich biodiversity and are quite unique for Eastern Europe, primarily with rich flora and

fauna, including a complex of boreal and Central European species. The current flora and vegetation of the study area are partially transformed due to human activity, and therefore the original areas of natural complexes (forest, meadow, and marsh ecosystems) are significantly reduced.

The phytodiversity of the study area is characterized by high floristic (more than 1500 species of natural flora) and coenotic diversity and is generally typical of Polissia. However, almost a third of the vascular plant species of Ukrainian Polissia have a limited distribution, require conservation, and have protected statuses. An important level of conservation of rare phytodiversity is the population-species, coenotic and landscape levels, which are implemented in the system of protected areas of the Polissia region of Ukraine (Andrienko *et al.*, 2001).

In Polissia, the system of protected areas, which was formed mainly in the second half of the twentieth century, includes five RLPs (118260.45 ha), which play an important role in the conservation of biodiversity in general and phytodiversity in particular. **Table 1** summarizes the area, geographical location, ecological and cenotic features and representativeness of the vascular plant flora and its zoological value in the Polissia RLPs as a whole (Parnikoza, n.d.; Mykytyn *et al.*, 2017; Kolomiychuk & Onyshchenko, 2018; Klestov, 2001; Karpenko *et al.*, 2022; Galchenko & Pryadko, 2003; Bulkowska, 2017). The inventory of vascular plant species of different levels of protection in the territories of regional landscape parks of the Ukrainian Polissia is of paramount importance for organizing a system of their protection, appropriate zoning, and biotechnical measures.

According to T. L. Andrienko, the rare components of the flora of Ukrainian Polissia can be generally classified into the following groups: 1) species at the interstate level of protection, listed in the European Red List, Appendix I of the Bern Convention, the IUCN Red List; 2) species at the state level of protection, listed in the Red Data Book of Ukraine; 3) species at the regional level of protection, which should be protected throughout the Ukrainian Polissia; 4) species at the local level of protection, included in the regional lists of rare species. While the lists of interstate and state protection are sufficiently substantiated, the issue of regionally rare species requires separate consideration and further development (Andrienko, 2006).

An important objective of floristic research in the Polissia RLPs is to establish the species composition and study the current state of rare phytodiversity of their territories within the research region (**Table 2**) (Andrienko & Peregrym, 2012; Regional..., 2021; Regional..., 2020, Red Data Book..., 2009; The list of..., 2018; List of regionally..., 2018; Bezsmertnyuk, 2016; Karpenko, 2023; Convention on the Conservation..., 2000; Convention on International..., 1983; The list..., 2018).

The study of quantitative and qualitative indicators of rare phytodiversity in the territories of the Polissia RLPs is of practical importance for understanding the coverage of different levels of protection, the dependence of the area of the parks and the representativeness of rare species of phytobiota, population and ecosystem processes, primarily habitat changes, the impact of climatic and reclamation processes, and the replacement of natural plantations with artificial crops; direct destruction (collecting for bouquets, digging up plants) and excessive recreational load (**Table 3**) (Convention..., 2005; Convention..., 2024; A list of..., 2008).

Pine, oak-pine, hornbeam and birch forests predominate in the Polissia RLP. The participation of forest coenoses of common oak decreases from west to east. Most of the forest ecosystems in the study area are derivative. These are birch and aspen

forests, which were formed locally after logging. Small areas are occupied by oak-hornbeam, alder, poplar and willow forests. The main feature of the forest ecosystems of the RLP, as well as Polissia as a whole, is their edaphic conditionality, in particular the predominance of sandy soils due to the influence of glaciers, which led to the predominance of scots pine among forest-forming species, but the current climatic conditions of the region are mostly partially favorable for deciduous species (common oak, hornbeam, sharp-leaved maple, heart-leaved linden), which have a limited distribution here on richer soils formed on loess or carbonate moraine.

Table 1. Regional landscape parks of the Ukrainian Polissia

Regional landscape parks name	Area (ha)	Location, administrative district, city, region	Brief coenotic description	Sozological value and representativeness of flora (vascular plants)
Pripyat-Stokhid	21600	Zarichna district of Rivne region	Meadow and marsh habitats and forests predominate, primarily on the Stokhid and Prypiat Rivers and the Prypiat boreal terrace	More than 700 species, including 27 species from the Red Data Book of Ukraine and 3 regionally rare species
Nadsluchansky	17271	South-eastern part of Bereznovsky district of Rivne region	Non-moral and boreal phytocoenocom plexes prevail	About 400 species, including 30 species from the Red Data Book of Ukraine and 107 regionally rare species
Ptashynyy Rai	466,8	Velykyi Pivnichnyi, Ptashynyi and Valkovskyi islands, Kyiv City outskirts	Common psammophytic communities, pine forests, floodplain meadows, wetlands and aquatic habitats	267 species, including 2 species from the Red Data Book of Ukraine and 2 regionally rare species
Mizhrichinsky	78753,95	Dnipro-Desna interfluve, southwestern part of Chernihiv region	Boreal forest and marsh habitats predominate	524 species, including 28 species from the Red Data Book of Ukraine and 51 regionally rare species
Yalivshchyna	168,7	North-eastern part of Chernihiv	Common forest and floodplain habitats	605 species, including 8 species from the Red Data Book of Ukraine and 14 regionally rare species

Table 2. Species of rare flora to be protected in the Polissia regional landscape parks

Name of the species	Sozological status of the species	Pripyat-Stokhid	Nadsluchansky	Ptashynny Rai	Mizhrichinsky	Yalivshchyna
1	2	3	4	5	6	7
<i>Agrimonia pilosa</i> Ledeb	BC				+	
<i>Aldrovanda vesiculosa</i> L.	RB, BC	+				
<i>Allium flavescens</i> Besser	RP		+			
<i>Allium lusitanicum</i> Lam.	RP		+			
<i>Allium podolicum</i> Blocki ex Racib. & Szafer	RP		+			
<i>Allium ursinum</i> L.	RB					+
<i>Anacamptis coriophora</i> (L.) R. M. Bateman	RB				+	
<i>Anacamptis palustris</i> R. M. Bateman	RB				+	
<i>Andromeda polifolia</i> L.	RP		+		+	
<i>Anemona nemorosa</i> (L.) Holub	RP					+
<i>Anemone sylvestris</i> L.	RP		+		+	
<i>Antennaria dioica</i> (L.) Gaertn.	RP		+			
<i>Anthemis subtinctoria</i> Dobrocz.	RP		+			
<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	RP		+		+	
<i>Asplenium septentrionale</i> (L.) Hoffm.	RP		+			
<i>Asplenium trichomanes</i> L.	RP		+			
<i>Astragalus arenarius</i> L.	RB	+			+	
<i>Astrantia major</i> L.	RP		+			
<i>Betula humilis</i> Schrank	RB	+			+	
<i>Botrychium multifidum</i> (S. G. Gmel.) Rupr.	RB, BC		+			
<i>Calla palustris</i> L.	RP		+			
<i>Campanula bononiensis</i> L.	RP		+		+	
<i>Campanula cervicaria</i> L.	RP		+		+	
<i>Campanula persicifolia</i> L.	RP		+		+	+
<i>Cardamine glanduligera</i> O. Schwarz	RP		+			
<i>Carex brizoides</i> L.	RP				+	
<i>Carex chordorrhiza</i> Ehrh.	RP				+	
<i>Carex hartmanii</i> Cajand.	RP		+		+	
<i>Carex juncella</i> (Fries) Th. Fries	RP		+		+	

Continued Table 2

1	2	3	4	5	6	7
<i>Carex lasiocarpa</i> Ehrh.	RP		+			
<i>Carex limosa</i> L.	RP				+	
<i>Carex montana</i> L.	RP		+			
<i>Carex umbrosa</i> Host	RB	+	+		+	
<i>Centaurea sumensis</i> Kalen.	RP				+	
<i>Cephalanthera bifolia</i> (L.) Fritsch	RB	+				
<i>Cephalanthera damasonium</i> (Mill.) Druce	RB		+			
<i>Cephalanthera longifolia</i> (L.) Fritsch	RB		+			
<i>Cervaria rivinii</i> Gaertn.	RP		+			
<i>Chimaphila umhellata</i> (L.) W. Barton	RP		+		+	
<i>Cimicifuga europaea</i> Schipcz.	RP		+			
<i>Clematis recta</i> L.	RP		+			
<i>Corydalis intermedia</i> (L.) Mérat	RP					+
<i>Criophorum vaginatum</i> L.	RP				+	
<i>Cypripedium calceolus</i> L.	RB, BC	+				
<i>Cystopteris fragilis</i> (L.) Bernh.	RP		+			
<i>Dactylorhiza fuchsii</i> (Druce) Sod	RB		+			
<i>Dactylorhiza incarnata</i> (L.) Soó	RB, CI	+	+		+	
<i>Dactylorhiza maculata</i> (L.) Soó	RB	+	+			
<i>Dactylorhiza majalis</i> (Rchb.) P. F. Hunt & Summerh.	RB	+	+		+	
<i>Daphne cneorum</i> L.	RB	+				
<i>Daphne mezereum</i> L.	RP		+			
<i>Dentaria bulbifera</i> L.	RP		+			
<i>Dianthus carthusianorum</i> L.	RP		+			
<i>Dianthus fischeri</i> Spreng.	RP				+	
<i>Dianthus pineticola</i> Kleopow	RP		+			
<i>Dianthus pseudosguarrosus</i> (Novak) Klokov	RP				+	
<i>Dianthus superbis</i> subsp. <i>stenocalyx</i> (Trautv. ex Juz.)	RP		+		+	
<i>Dianthus membranaceus</i> Borbas.	RP		+			
<i>Digitalis grandiflora</i> Mill.	RP		+			+
<i>Diphasiastrum complanatum</i> (L.) Holub	RB				+	
<i>Diphasiastrum zeilleri</i> (Rouy) Holub	RB		+			
<i>Drosera intermedia</i> Hayne	RB	+	+		+	
<i>Drosera rotundifolia</i> L.	RP		+		+	

Continued Table 2

1	2	3	4	5	6	7
<i>Dryopteris cristata</i> (L.) A Gray	RP		+		+	
<i>Dryopteris dilatata</i> (Hoffm.) A. Gray	RP		+		+	
<i>Epipactis atrorubens</i> (Hoffin. ex Bemt) Schult.	RB	+	+			
<i>Epipactis helleborine</i> (L.) Crantz	RB, CI	+	+		+	+
<i>Epipactis palustris</i> (L.) Crantz	RB, CI	+			+	
<i>Equisetum hyemale</i> L.	RP				+	+
<i>Equisetum variegatum</i> Schleich. ex F. Weber & D. M. H. Mohr	RP		+			
<i>Euphorbia angulata</i> Jacq.	RP		+			
<i>Fragaria moschata</i> Duch.	RP				+	
<i>Galanthus nivalis</i> L.	RB					+
<i>Galium intermedium</i> Schult.	RP		+			
<i>Genista germanica</i> L.	RP		+			
<i>Gentiana cruciata</i> L.	RP		+			
<i>Gentiana pneumonanthe</i> L.	RP		+		+	
<i>Geranium sanguineum</i> L.	RP		+			
<i>Geranium sylvaticum</i> L.	RP		+			
<i>Geum aleppicum</i> Jacq.	RP	+	+			
<i>Gladiolus imbricatus</i> L.	RB		+			
<i>Goodyera repens</i> (L.) R. Br.	RB		+			
<i>Gymnocarpium dryopteris</i> (L.) Newm.	RP		+		+	+
<i>Hedera helix</i> L.	RP		+			
<i>Helianthemum ovatum</i> (Viv.) Dun.	RP		+		+	
<i>Hippuns vulgaris</i> L.	RP				+	
<i>Huperzia selago</i> (L.) Bemb.	RB	+	+			
<i>Hydrocotyle vulgaris</i> L.	RB	+				
<i>Hylotelephium argutum</i> (Haw.) Holub	RP				+	
<i>Hypericum hirsutum</i> L.	RP		+			
<i>Hypericum humifusum</i> L.	RP		+			
<i>Hypericum maculatum</i> Crantz	RP		+			
<i>Hypericum montanum</i> L.	RP		+			
<i>Inula aspera</i> Poir.	RP		+			
<i>Inula hirta</i> L.	RP		+			
<i>Iris aphylla</i> subsp. <i>Hungarica</i> Waldst. & Kit.	RP, BC		+		+	
<i>Iris sibirica</i> L.	RB		+		+	

Continued Table 2

1	2	3	4	5	6	7
<i>Isopyrum thalictroides</i> L.	RP		+			
<i>Jacobaea borysthenica</i> (DC.) B. Nord. & Greuter	ER				+	
<i>Jovibarba sobolifera</i> (Sims.) Opiz	RB	+	+			
<i>Juncus bulbosus</i> L.	RB		+		+	
<i>Juncus squarrosus</i> L.	RP		+			
<i>Juniperus communis</i> L.	RP				+	+
<i>Jurinea calcarea</i> Klokov	RP		+			
<i>Jurinea cyanoides</i> (L.) Rchb	BC				+	
<i>Lacerpitium prutenicum</i> L.	RP		+			
<i>Laser trilobum</i> (L.) Borfch.	RP		+			
<i>Lathyrus niger</i> (L.) Bernh.	RP		+			
<i>Ledum palustre</i> L.	RP				+	
<i>Lembotropis nigricans</i> (L.) Griseb.	RP		+			
<i>Lilium martagon</i> L.	RB	+	+		+	+
<i>Liparis loeselii</i> (L.) Rich.	RB, BC				+	
<i>Listera ovata</i> (L.) R. Br.	RB				+	
<i>Lycopodiella inundata</i> (L.) Holub	RB				+	
<i>Lycopodium annotinum</i> L.	RB	+	+		+	
<i>Malva excisa</i> Rchb.	RP		+			
<i>Matteuccia struthiopteris</i> (L.) Tod.	RP		+			+
<i>Melica transsilvanica</i> Schur	RP		+			
<i>Melittis sarmatica</i> Klokov	RP		+			
<i>Menyanthes trifoliata</i> L.	RP				+	
<i>Neottia nidus-avis</i> (L.) Rich.	RB	+	+			
<i>Nepeta pannonica</i> L.	RP		+			
<i>Nymphaea alba</i> L.	RP	+	+	+	+	
<i>Nymphaea candida</i> C.Presl	RP	+	+		+	
<i>Nymphoides peltata</i> (S. G. Gmel.) Kuntze	RB		+			
<i>Omphalodes scorpioides</i> (Haenke) Schrank	RP		+			
<i>Ophioglossum vulgatum</i> L.	RP				+	
<i>Orthilia secunda</i> (L.) House	RP		+			
<i>Ostericum palustris</i> (Besser) Hoffm.	RP, BC				+	

Continued Table 2

1	2	3	4	5	6	7
<i>Oxycoccus palustris</i> Pers.	RP				+	
<i>Parnassia palustris</i> L.	RP				+	
<i>Pedicularis sceptrum-carolinum</i> L.	RB				+	
<i>Peucedanum cervaria</i> (L.) Lapeyr.	RP				+	
<i>Phegopteris connectilis</i> (Michx.) Watt	RP		+			
<i>Phleum phleoides</i> (L.) H. Karst.	RP		+			
<i>Phyteuma spicatum</i> L.	RP		+			
<i>Pimpinella dissecta</i> Sieber ex C. Presl	RP		+			
<i>Platanthera bifolia</i> (L.) Rich.	RB, CI	+	+		+	+
<i>Platanthera chlorantha</i> (Custer) Rchb.	RB	+	+			
<i>Polemonium caeruleum</i> L.	RP		+			
<i>Polygala decipiens</i> Besser	RP		+			
<i>Polypodium vulgare</i> L.	RP		+			
<i>Polyslichum aculeatum</i> (L.) Roth	RP				+	+
<i>Potamogeton alpinus</i> Balb.	RP				+	
<i>Potamogeton pusillus</i> L.	RP			+		
<i>Potentilla alba</i> L.	RP		+		+	
<i>Potentilla heptaphylla</i> L.	RP		+			
<i>Potentilla obscura</i> Willd.	RP		+			
<i>Premogone saxatilis</i> (L.) Ikonn.	RP				+	
<i>Primula elatior</i> (L.)	RP		+			
<i>Prunus spinosa</i> L.	RP					+
<i>Pteridium aquilinum</i> (L.) Kuhn	RP				+	+
<i>Pulmonaria angustifolia</i> L.	RP				+	
<i>Pulsatilla patens</i> (L.) Mill.	RB, BC				+	
<i>Pyrethrum corymbosum</i> (L.) Scop.	RP		+			
<i>Rhododendron luteum</i> Sweet	RP, BC		+			
<i>Rhynchospora alba</i> (L.) Vahl	RP		+			
<i>Rosa mediata</i> Dubovik	RP		+			
<i>Rosa villosa</i> L.	RP		+			
<i>Rubus hirtus</i> Aspegren	RP		+			
<i>Salix myrsinifolia</i> Salisb.	RP		+			

Continued Table 2

1	2	3	4	5	6	7
<i>Salix myrtilloides</i> L.	RB	+	+		+	
<i>Salix starkeana</i> Willd.	RB	+				
<i>Salvinia natans</i> (L.) All.	RB	+		+	+	+
<i>Scheuchzena palustris</i> L.	RB				+	
<i>Scilla bifolia</i> L.	RP		+			+
<i>Scilla siberica</i> Andrews	RP					+
<i>Scorzonera humilis</i> L.	RP		+			
<i>Scutellaria altissima</i> L.	RP		+			
<i>Sedum sexangulare</i> L.	RP		+		+	
<i>Sempervivum ruthenicum</i> Schnittsp. & C. B. Lehm.	RP				+	
<i>Serratula tinctoria</i> L.	RP		+			
<i>Seseli libanotis</i> (L.) W. D. J. Koch	RP		+			
<i>Silene chlorantha</i> (Willd.) Ehrh.	RP		+			
<i>Silene lithuanica</i> Zapal.	RB, ER		+		+	
<i>Sparganium natans</i> L.	RP		+			
<i>Spiraea media</i> Schmidt	RP		+			
<i>Stipa borysthena</i> Klokov ex Prokudin	RB				+	
<i>Stipa pennata</i> L.	RB		+			
<i>Succisella inflexa</i> (Kluk) Beck	RB	+	+			
<i>Syringa josikaea</i> J. Jacq. ex Rchb.	RB, BC					+
<i>Teesdalia nudicaulis</i> (L.)	RP		+			
<i>Thymus marschallianus</i> Willd.	RP		+			
<i>Tragopogon ucrainicus</i> Artemczuk	RP, ER			+	+	
<i>Trapa natans</i> L.	RB, BC			+	+	+
<i>Trifolium alpestre</i> L.	RP		+			
<i>Trifolium montanum</i> L.	RP		+			
<i>Utricularia vulgaris</i> L.	RP				+	
<i>Utricularia intermedia</i> Hayne	RB	+	+			
<i>Utricularia minor</i> L.	RB		+		+	
<i>Valeriana exaltata</i> Mikan	RP				+	
<i>Veratrum lobelianum</i> Bernh.	RP		+			
<i>Veronica beccabunga</i> L.	RP		+			

End of the Table 2

1	2	3	4	5	6	7
<i>Veronica spuria</i> L.	RP		+			
<i>Veronica teucrium</i> L.	RP		+			
<i>Vicia pisiformis</i> L.	RP		+			
<i>Vinca minor</i> L.	RP				+	+
<i>Viola rupestris</i> F. W. Schmidt	RP		+			
<i>Viola uliginosa</i> Besser	RP				+	
<i>Xanthoselinum alsaticum</i> (L.) Schur	RP		+			

RB – species listed in the Red Data Book of Ukraine
 RP – species subject to regional protection
 BC – species from Appendix I of the Berne Convention
 ER – species from the European Red List
 CI – Annex II of CITES

Table 3. Representativeness of the regional landscape parks of the Ukrainian Polissia in the system of different levels of phytobiota protection

Name of regional landscape parks	Protection Levels				
	Red Data Book of Ukraine	Regional Conservation Lists	Annex I of the Berne Convention	European Red List	Annex II CITES
Pripyat-Stokhid	27	3	2	-	4
Nadsluchansky	30	107	3	1	3
Ptashynyy Rai	2	2	1	1	-
Mizhrichynskyi	28	51	7	3	4
Yalivshchyna	8	14	2	-	2

The marsh and hydrophilic ecosystems of the RLPs in Polissia are represented by eutrophic grass communities, which are concentrated mainly in river floodplains, while dry and lowland meadows are now preserved in small areas in the woods. Aquatic and riparian vegetation in the study area is widespread, but does not occupy large areas; it is diverse in nature, and tends to concentrate mainly in wetlands, old channels, open water bodies and floodplains (Andrienko *et al.*, 2001).

Based on the assessment of ecological and cenotic affiliation, biotopic distribution and study of habitats of rare vascular plant species in the RLP territories of the Ukrainian Polissia, we found that the greatest diversity and representation of rare and protected species are in the following habitats: forest (87 species), herbaceous (85 species), marsh (36 species), and aquatic (30 species) (Kuzemko *et al.*, 2018) (**Table 4**).

Table 4. Ecological and coenotic distribution of rare species of regional landscape parks of the Ukrainian Polissia

Name of the base biotope	Number of species				
	Pripyat-Stokhid	Nadsluchansky	Ptashyny Rai	Mizhrichensky	Yalivshchyna
Forest	6	48	-	21	12
Herbal	8	48	1	25	3
Swamp	6	13	-	16	1
Water	6	8	4	10	2
Shrubby	3	6	-	6	4
Synanthropic	-	-	-	1	-
Stony detachments	1	-	-	3	-

The highest representation of rare species in forest habitats is determined by different groups of forest ecosystems that are widespread, edaphic habitat and significant forest cover areas that are part of the RLP territories. The representativeness of rare species in herbaceous habitats is due to the presence of open meadow areas and forest edges. The representation of rare species in marsh and aquatic habitats is much lower due to the influence of anthropogenic factors in the past and the smaller areas of water bodies that are part of the parks.

CONCLUSION

The study findings indicate that the rare vascular plant flora of the Polissia RLPs is represented by 56 species included in the Red Data Book of Ukraine, 145 species of regional protection provided in three oblasts of the Polissia region, nine species from Appendix I of the Bern Convention, four species from Appendix II of CITES, and three species included in the European Red List. Two RLPs are the most zoologically representative in the study area: Nadsluchansky (six species of international protection statuses, 30 species of the Red Data Book of Ukraine, 107 species of regional protection level) and Mizhrichensky (14 species of international protection statuses, 28 species of the Red Data Book of Ukraine, 51 species of regional protection level), which is determined by the peculiarity of natural conditions, habitat diversity and area of the territories. RLPs as a category of nature reserve fund of regional status within the Polissia region of Ukraine cover most of the representative habitats, which include a corresponding number of rare species of different levels of protection, namely: forest (87 species), herbaceous (85 species), marsh (36 species) and aquatic (30 species) habitats.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest: the authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Animal Rights: this article does not contain any studies with animal subjects performed by any of the authors.

AUTHOR CONTRIBUTIONS

Conceptualization, [V.S.; Yu.K.]; methodology, [Yu.K.]; validation, [V.S.]; formal analysis, [V.S.]; investigation, [V.S.; Yu.K.]; resources, [V.S.; Yu.K.]; data curation, [V.S.]; writing – original draft preparation, [V.S.; Yu.K.]; writing – review and editing, [V.S.; Yu.K.]; visualization, [V.S.] supervision, [Yu.K.]; project administration, [V.S.; Yu.K.].

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ВИДИ СУДИННИХ РОСЛИН РІЗНИХ РІВНІВ ОХОРОНИ ТА ПРЕДСТАВЛЕНІСТЬ В ЕКОСИСТЕМАХ РЕГІОНАЛЬНИХ ЛАНДШАФТНИХ ПАРКІВ УКРАЇНСЬКОГО ПОЛІССЯ

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Українське Полісся можна вважати самотутнім регіоном в аспекті біологічного різноманіття, у якому зберігається значна кількість північних, бореальних видів і угруповань, а в Західному Поліссі – також центральноєвропейських. Регіон досліджень простягається із заходу на схід на 750 км, з півночі на південь на 120–150 км, у північно-східному напрямку його територія поступово звужується до 50–80 км і становить значну частину важливого екологічного коридору Східної Європи.

Обґрунтування. Природні умови Українського Полісся сприятливі для формування хвойних, широколистяних і мішаних лісів, які тут є зональними угрупованнями. Значне поширення флювіогляціальних відкладів зумовлює переважання піщаних дерново-підзолистих ґрунтів і пов'язаних із ними соснових лісів. Високий рівень ґрунтових вод, знижений характер поверхні сприяють розвитку евтрофних торфових боліт. Сприятливі кліматичні умови обумовлюють формування різноманітного рослинного покриву, що сприяє репрезентативності і значному збереженню флористичного та ценотичного різноманіття. Одна з ключових ролей в охороні рідкісних видів фіторізноманіття поліського регіону України належить поліфункціональним природно-заповідним територіям, серед яких є категорія “регіональні ландшафтні парки”. Вони охоплюють охороною понад 200 видів судинних рослин поліського регіону з різним природоохоронним статусом – від міжнародного рівня охорони до регіонального.

Матеріали та методи. Дослідження проводили з використанням загальноприйнятих польових (маршрутний, геоботанічних описів ключових територій) та камеральних методів. Назви видів відповідають зведенню даних Міжнародного індексу назв рослин (IPNI), а їхня належність до охоронних категорій – критеріям збереження та рівням охорони, згідно з нормативно-правовими документами.

Результати. Представлено матеріали досліджень фіторізноманіття регіональних ландшафтних парків (Прип'ять-Стохід, Надслучанський, Пташиний рай, Міжреченський, Ялівщина), зокрема, рідкісних видів, серед яких є низка гляціальних реліктів, ендеміків і пограничноареальних видів, що ростуть на південній або східній межі ареалу поширення.

Висновки. Загалом було встановлено, що раритетна флора судинних рослин територій регіональних ландшафтних парків Українського Полісся представлена 56 видами, включеними до Червоної книги України, 145 видами регіональної охорони, яка забезпечується у трьох областях поліського регіону, дев'ятьма видами із Додатку I Бернської конвенції, чотирма видами із Додатку II CITES і трьома видами, які включені до Європейського Червоного списку. Найбільш соціологічно на території досліджень представлено два регіональні ландшафтні парки: “Надслучанський” (6 видів міжнародних статусів охорони, 30 видів із Червоної книги України, 107 видів регіонального рівня охорони) і “Міжреченський” (14 видів

міжнародних статусів охорони, 28 видів із Червоної книги України, 51 вид регіонального рівня охорони), що визначається своєрідністю природних умов, різноманіттям біотопів і площею територій. Регіональні ландшафтні парки як категорія природно-заповідного фонду регіонального статусу в межах поліського регіону України охоплюють більшість представлених біотопів, які у своєму складі мають відповідну кількість рідкісних видів різних рівнів охорони, а саме: лісові (87 видів), трав'яні (85 видів), болотні (36 видів) та водні (30 видів) біотопи.

Ключові слова: Українське Полісся, регіональні ландшафтні парки, фіторізноманіття, судинні рослини, види міжнародної охорони, Червона книга України, види регіональної охорони