

Cultural ecosystem services of the protected parks of Ukraine during the war

Presented at the Conference 'A century of forest knowledge – education, innovations, challenges (CENFORKNOW 2025)', 7–9 May 2025, Sofia, Bulgaria

Thematic field: Forest policy and key challenges

Anzhela Dzyba^{1*}, Nataliia Boiko², and Nataliia Doiko²

¹Department of Landscape Architecture and Phytodesign, Education and Research Institute of Forestry and Landscape-Park Management, National University of Life and Environmental Sciences of Ukraine, 03041, 19 Horikhuvatskyi Shliakh Str., Kyiv, Ukraine.

*E-mail: orhideya_onydium@ukr.net

²The 'Olexandria' State Dendrological Park of the National Academy of Sciences of Ukraine, 09113 Kyiv region, Bila Tserkva – 13, Ukraine.

Received: 25 July 2025 / Accepted: 11 October 2025 / Available online: 24 October 2025



Open Access: This work is distributed under the Creative Commons Attribution 4.0 License.

Abstract

In this study, we determined the effectiveness and perceived satisfaction with cultural ecosystem services in Ukraine during the war in six protected areas. The aim of the study was to determine the importance and effectiveness of eight cultural ecosystem services during the war for visitors to six protected parks in four regions of Ukraine. The following methods were used: field survey (route), analytical, systematisation, sociological, socio-psychological and statistical; the Likert psychometric scale was used to survey visitors to protected parks. The data were analysed using descriptive statistics. In all parks, female respondents predominated, their participation ranged from 52.8 % to 69.2 %. Park visitors were mainly young people aged 16–30 (from 30.6 % to 77.5 %) and people aged 51–64. During the war, visitors to all studied parks noted the importance and effectiveness of cultural ecosystem services, such as recreation, aesthetics, and natural history. The age groups 16–30 and 51–64 were the most in need of such services. The effectiveness and importance of the service of inspiration were confirmed, while spiritual enrichment scored the lowest among all age groups in the four parks. Almost one third of visitors in four parks offered suggestions for improving environmental quality, with the greatest demand being for enhanced landscaping and an increase in the number of trees. The quality of vegetation and the location of the parks influenced overall visitors' satisfaction. The results of this research can be used to improve environment quality through urban green spaces and to address community needs via cultural ecosystem services provided by the studied parks.

Key words: cultural heritage, park users, protected areas, recreation, visitor surveys.

Introduction

The aesthetic quality of the landscape and the presence of special wildlife habitats create positive impacts on people (Havinga et al. 2024). However, rapid urbanisation has caused conflicts between blue-green spaces and other urban infrastructure, which challenges urban planning efforts aimed at improving the well-being of city residents (Huang et al. 2024). Ukraine has been experiencing war for over three years, which is bringing economic and social changes, reducing the area of green spaces and worsening the ecological condition of existing ones. Therefore, one of the intangible benefits that the environment can currently provide to people is cultural ecosystem services (CES). These are a crucial component of ecosystem services (ES), which represent social and humanitarian values (Yang and Duan 2024). They contribute to human well-being and, simultaneously, CES and Blue carbon ecosystems also play a significant role in mitigating global climate change (Quevedo and Kohsaka 2024). Urban green spaces facilitate the interaction of residents with blue-green infrastructure and play a key role in strengthening the human–nature connections, as they offer diverse opportunities for direct contact with the natural environment.

They are reliable providers of CES, the intangible benefits that arise from interactions between people and nature (Grzyb 2024, Li et al. 2024). The diverse cultural ecosystem services provided by urban parks have a direct impact on human health and well-being (Song et al. 2023).

CES improve mental and physical health by providing access to blue-green spaces through aesthetic and recreational experiences that vary with seasonality (Huang et al. 2024). Recreation

in green and blue spaces contributes to the well-being of urban residents in multiple ways, and the nature of the impact depends both on the characteristics of the space and on those of the visitors (Grzyb 2024). The delivery of CES benefits is significantly influenced by elements of the natural landscape (Li et al. 2024). Assessing the motivations and perceived benefits associated with CES is important, especially in areas with conflicting interests (Pinto et al. 2024).

Protected areas provide invaluable non-market ES, drawing increasing attention to their cultural dimensions (Gan et al. 2024). Parks and protected areas are crucial for delivering both tangible and intangible benefits to society, derived from healthy ecosystems (Ferguson et al. 2023). Understanding the relationship between the CES, provided by parks and the characteristics of different visitor groups, can contribute to the public's willingness to engage with nature, while the effective communication of CES values can support the protection and enhance park ecosystems (Song et al. 2023).

The purpose of the study was to identify the perceived importance and effectiveness of eight cultural ecosystem services during the war, as experienced visitors to six protected parks across four regions of Ukraine.

Materials and Methods

The study was conducted in six protected parks during the first half of the day on weekends in August 2024: the 'Olexandria' State Dendrological Park (DP) of the National Academy of Sciences of Ukraine, the 'Horodnytskyi' Park-Monument of Landscape Art (PMLA), the 'Myklukho-Maklai' PMLA, the 'Shatskyi'

National Nature Park (NNP, arboretum), the 'Bereznivskiy' National Dendrological Park, and the 'Hamarnia' Landscape Preserve (LP, arboretum).

The NNP Shatskyi (arboretum) covers an area of 48,977 ha, of which 22,882.6 ha are owned by the park. It includes different zones: protected zone, zone of regulated recreation, zone of stationary recreation, economic zone. The park's territory mostly includes typical ecosystems of the Western Polissya region: lake, forest, swamp, and meadow ecosystems (Shatsky National Nature Park 2025). Pine stands (*Pinus sylvestris* L.) cover most of the territory. The NNP Shatskyi (arboretum) covers 1.5 ha and contains 147 species of woody plants, 109 of which are rare.

The DP 'Bereznivskiy' occupies an area of 29.5 ha, where 750 species, varieties, and cultivars of woody plants could be found (Oleksiichenko et al. 2019). The following plant collections are represented: 'Forests of the Plains of Ukraine', 'Carpathians', 'Crimea', 'Siberia', 'Far East', 'Central Asia', 'North America', 'China and Japan', 'Rosarium', 'Syringarium', 'Birch Grove', 'Garden of Philadelphus', 'Willows', and other landscape compositions. The park serves as an educational centre. A cascade of fountains was constructed within the territory of the DP 'Bereznivskiy', but currently it is not working.

The PMLA 'Horodnytskyi' was established in the 1890s by Y. K. Czartoryski on the banks of the Sluch River. The park covers an area of 21 ha, on the right-bank part of the park (9.8 ha) deciduous tree species aged 90-130 prevail, while on the left-bank part (11.2 ha), there are mostly coniferous plantations of *Pinus sylvestris*. In total, 52 species of woody plants grow in the park. There is a water spring, a dance floor, a fountain, which is currently in need of restoration.

Three parks – the 'Myklukho-Maklai'

PMLA, the LP 'Hamarnia' (arboretum) in the Zhytomyr region, and the 'Olexandria' State DP in the Kyiv region – have been affected by the RAA.

The 'Myklukho-Maklai' PMLA covers an area of 29.6 ha, has three lakes, children's playgrounds and sports grounds, an open-air theatre, recreational areas, a fountain, cafes, a gazebo with a transparent roof for conducting masterclasses, sculptures, monuments, as well as a natural spring (Malyn City Council 2025). The park's forest ecosystems are dominated by *Quercus robur* L. (31 %) and *Pinus sylvestris* (20 %). There are a total of 66 species and forms of woody plants, with native species prevailing. The group of introduced species is small. The following types of garden and park landscapes are represented: forest (58.8 %), park (28.3 %), meadow (8.9 %), regular park and its elements (1.0 %), and a garden (3.0 %) (Markov and Vyshnevskiy 2013).

The LP 'Hamarnia' comprises three parts: the first (36.0 ha), which includes an arboretum and the Myklukho-Maklai Historical and Local History Museum; the second (300 ha) – a forest with deciduous and coniferous tree species; the third part (795 ha) – the Malynske water reservoir. A significant area is covered by the 100–50-year-old *Pinus sylvestris* and *Quercus robur*, 100–10-year-old *Betula pendula* Roth. and *Alnus glutinosa* (L.) Gaertn. trees. In total, there are 134 species of woody plants, among which deciduous species prevail (82 %).

The 'Olexandria' State Dendrological Park of the National Academy of Sciences of Ukraine was established at the end of the 18th century (1788) by the Branicki family. The arboretum is protected as a National Heritage Site. The current area of the park is 400.7 ha. The historical part is 201.5 ha, where unique natural and

artificial historical landscapes have been preserved. There are three valleys with cascades of ponds, hydraulic structures, and small architectural forms of the late 18th – 19th centuries. The park's centuries-old oak forest (50 ha), in which almost 2000 specimens of *Quercus robur* over 200-year-old grow, has scientific, structural and artistic value. Since the end of the 18th century, the 'Olexandria' park has become one of the first centres of plant introduction in Ukraine. Currently, there are 20 trees of various species at age of over 200. The park includes three collection and demonstration areas: 'Syringirium' (67 species and varieties), 'Cotineretum' (276 species and cultivars) and 'Rosarium' (280 varieties of roses). There is a history museum and a scientific and educational centre (Galkin 2012).

The survey followed the ethical standards while working with people: the research was conducted in accordance with the principles of the Helsinki Declaration of 1975, revised in 2013 (WMA 2013). The eight most common CES (aesthetics, recreation, knowledge of nature, social relations, cultural heritage, inspiration, sense of place, spiritual or religious enrichment) were selected and an anonymous survey was conducted taking into account their perceived importance and effectiveness among casual park visitors. A total of 247 respondents from the six parks across four regions of Ukraine (Volyn, Rivne, Zhytomyr, and Kyiv regions) were surveyed. Respondents from various age categories participated in the survey: 16–30, 31–40, 41–50, 51–64, and 65 years and over.

The questionnaire comprised four sections. In the first section, respondents provided basic socio-demographic information. The second and third sections were aimed at assessing the subjective importance and the perceived level of satisfac-

tion (effectiveness) of cultural ecosystem services (CES), which were measured on a five-point Likert scale: from 1 – extremely unimportant to 5 – very important, and from 1 – extremely dissatisfied to 5 – extremely satisfied, respectively. The assessment of importance and effectiveness covered eight CES categories: aesthetic value, recreational function, knowledge of nature, social connections, cultural heritage, inspiration, sense of place and spiritual or religious enrichment. The last section contained an open-ended question, in which participants could suggest measures to improve the park environment (Gai et al. 2022b). The method of analysis of importance was used to interpret the results. Data processing was carried out using IBM SPSS Statistics version 29.0. Likert scale scores were converted into numerical values to quantify importance and satisfaction across all CES categories. The reliability of the questionnaire was tested using Cronbach's alpha coefficient.

Study area

The study was conducted in six protected areas of Ukraine, including two dendrological parks (DP), two park-monuments of landscape art (PMLA), the arboretum within a national nature park (NNP) and a landscape preserve (LP) (figs 1 and 2).

Results and Discussion

Since February 2022, as a result of the Russian armed aggression (RAA), more than 21.9 % of protected areas in Ukraine (812 protected areas with a total area of 0.9 million hectares) have been affected, and 19.5 % (514 protected areas, 0.8 million hectares) remain occupied (WWF

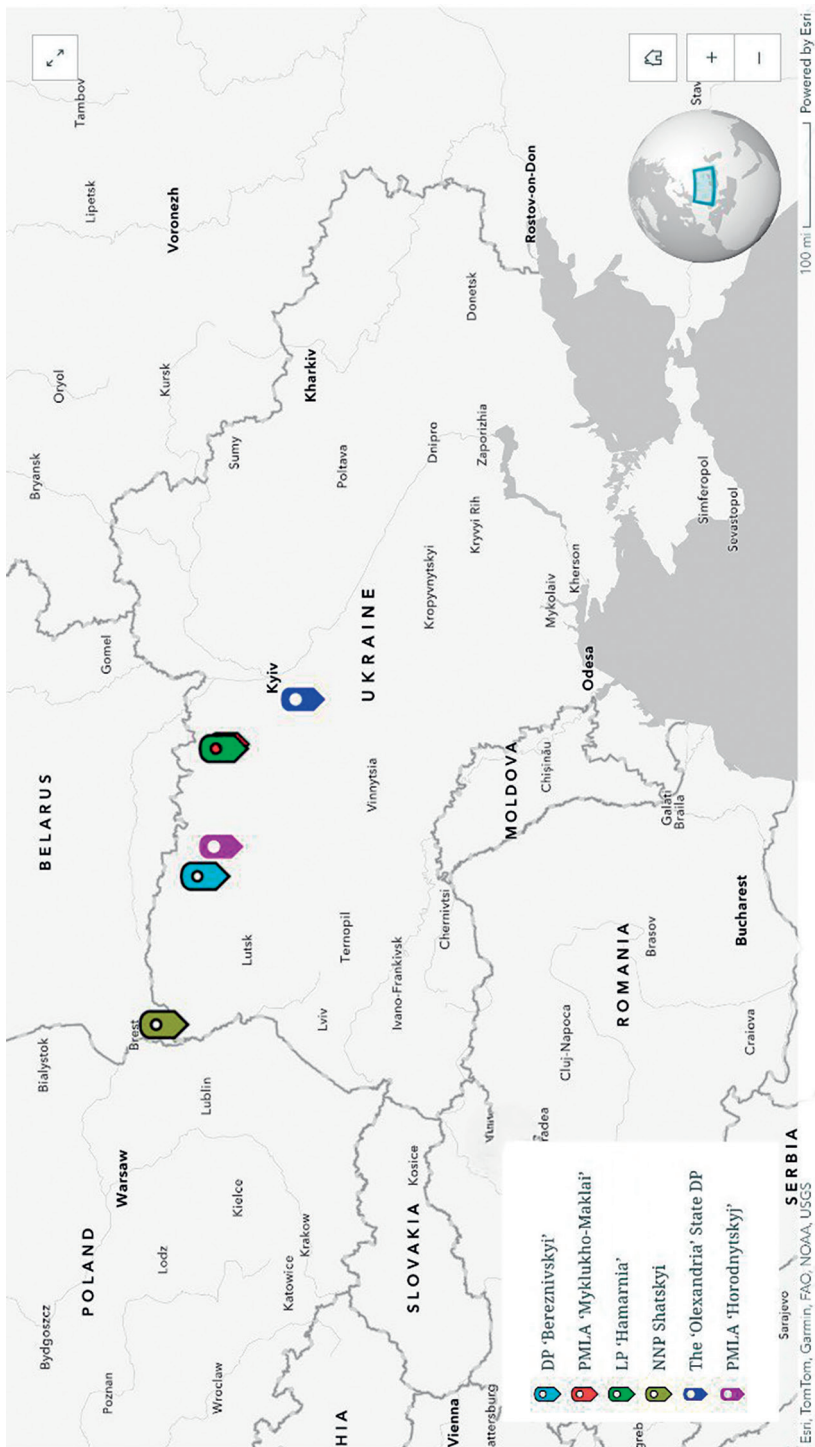


Fig. 1. Protected parks of Ukraine. Source: internet service ArcGIS Online, 2025.

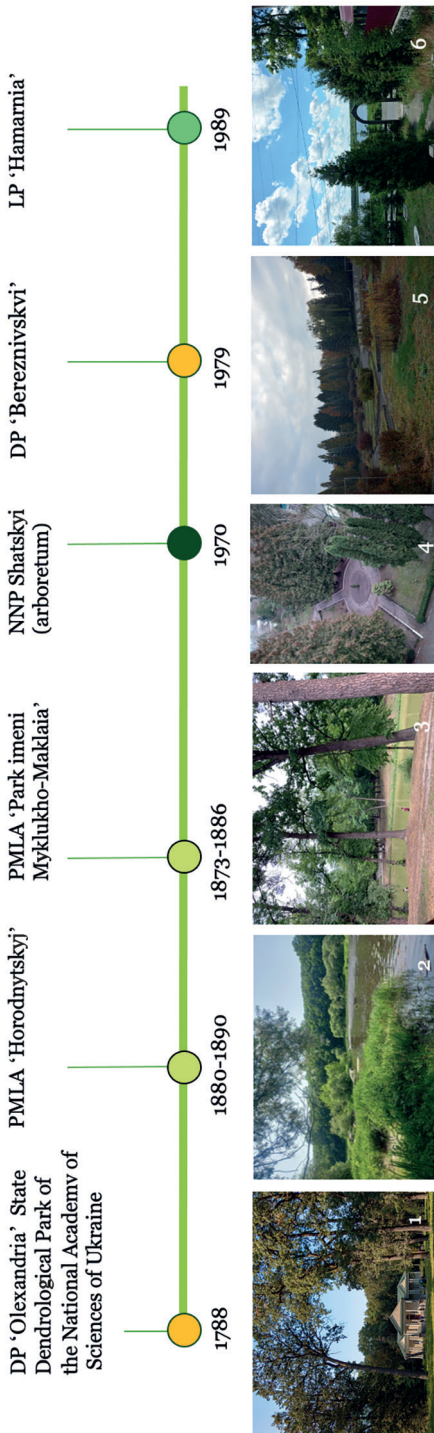


Fig. 2. Representative views of cultural ecosystem services in protected parks in Ukraine.

Ukraine 2023). Biodiversity is lost through warfare (Hanson 2018). The loss of wildlife habitat in war zones depends on the scale, intensity and technology of the conflict. Munitions and chemicals also have direct and indirect, as well as immediate and residual impacts on wildlife habitat (Dudley et al. 2002). This leads to significant changes in population and land use and stimulates an increase in plantings and preservation of existing protected areas, including parks. To provide the variety of user groups and relatively even distribution of parks throughout the research area, and to identify the importance and effectiveness of CES of protected parks, six protected areas in four different regions of Ukraine were selected. Various categories of protected parks were chosen (dendrological parks, park-monuments of landscape art, arboretum within the national natural parks and landscape preserve), which are located in relatively safe territories (north-western regions of Ukraine – Volyn, Rivne regions and the western part of Zhytomyr region of Central Ukraine), and those that have been by subjected to the RAA (Northern part of Central Ukraine – Zhytomyr, Kyiv regions). The NNP Shatskyi in Volyn region, DP 'Bereznivskyi' in Rivne region and the PMLA 'Horodnytskyi' in the Zhytomyr region were located in relatively safe regions.

In all studied parks, the ratio of male and female respondents was not uniform. Female visitors dominated in all parks, with their proportion ranging from over 52.8 % in the DP 'Bereznivskyi' to 69 % in the PMLA 'Horodnytskyi' (Table 1).

In four parks, the proportion of men who visited those parks was less than 40 %. However, as late as in the end of 2022, men were more common in the Sovky Park of the Kyiv region (Dzyba and

Table 1. Demographic and socio-economic characteristics of park visitors, in %.

Categories	Region and parks					
	Volyn		Zhytomyr		Rivne	Kyiv
	NNP Shatskyi	PMLA 'Horodnytskyj'	PMLA 'Park Myklukho-Maklaia'	LP 'Hama-rnia'	DP 'Bereznivskyi'	'Olexandria' State DP
Gender						
Male	41.2	31.0	35.7	31.6	47.2	40.0
Female	58.8	69.0	64.3	68.4	52.8	60.0
Age, years						
16–30	14.3	77.5	52.4	36.8	30.6	23.6
31–40	20.0	17.5	16.7	15.8	13.9	20.0
41–50	22.9	5.0	21.4	15.8	8.3	14.6
51–64	31.4	-	7.1	15.8	30.6	23.6
64+	11.4	-	2.4	15.8	16.6	18.2
Education						
School	2.9	9.5	19.0	2.6	30.6	9.1
College	8.6	11.9	40.5	47.4	22.2	25.4
University	88.5	78.6	40.5	50.0	47.2	65.5
Monthly income (UAH)						
<10,000	62.8	78.6	71.4	71.1	80.6	58.2
10,000–20,000	34.3	19.0	21.4	23.7	19.4	18.2
20,000–30,000	2.9	2.4	2.4	2.6	-	12.7
>30,000	-	-	4.8	2.6	-	10.9
Absent income	-	-	-	-	16.7	-
Occupation						
Service-/factor workers	-	16.7	21.4	21.1	2.8	20.0
Government/corporate and technical staff	74.2	45.2	42.9	44.7	41.6	45.4
Pensioners	20.0	-	2.4	10.5	27.8	18.2
Pupils/students	2.9	28.6	30.9	23.7	27.8	10.9
Unemployed	2.9	9.5	2.4	-	-	5.5
Place of residence						
Local residents	85.7	92.8	81.0	65.8	72.2	74.5
Displaced persons	2.9	4.8	-	-	5.6	9.1
Passers-by	11.4	2.4	19.0	34.2	22.2	16.4

Saveliev 2023). In five parks, the majority of respondents were young people, whose share ranged from 23.6 % (the 'Olexandria' State DP) to 77.5 % (PMLA 'Horodnytskyj'), except for the NNP Shatskyi, where visitors were mainly people aged 51–64 (31.4 %), which is explained by the specifics of the park.

Most respondents had higher education and were employed in governmental, corporate, or technical professions. The share of this group in the NNP Shatskyi was the highest – 74.2 %. In the other five parks their share was almost uniform from 41.6 % in the DP 'Bereznivskyi' to 45.4 % in the 'Olexandria' State DP and

also was independent of the geographic region. There was also a certain share of service-oriented workers, pupils and students.

In all parks, the monthly income of the majority of visitors (from 58.2% in the 'Olexandria' State DP to 80.6 % in DP 'Bereznivskiy') was not high, which shows the accessibility of cultural ES regardless of the region. Small number of visitors were unemployed, which occurred in three regions.

In six parks, visitors were mostly local residents, while in four parks a small proportion of visitors were displaced persons, ranging from 2.9 % in NNP Shatskyi to 9.1 % in the 'Olexandria' State DP. These parks are located in relatively dangerous regions of Ukraine, where people moved at the beginning of the war in 2022. Also, the respondents of the parks included passers-by, a significant number of whom, 34.2 and 22.2 %, were noted in two parks of two regions, respectively, the LP 'Hamarnia' (Zhytomyr Region) and the DP 'Bereznivskiy' (Rivne Region), which is explained by the location of the parks

in relation to residential areas. In general, everything to some extent indicates the diversity of people visiting parks.

Tables 2–7 present both the Cronbach's alpha coefficients of each CES category and the respondents' ratings of importance and effectiveness across the eight CES categories. The Cronbach's alpha coefficient for most categories in six parks was higher than 0.6, except for two elements in the PMLA 'Myklukho-Maklai' and three elements in the LP 'Hamarnia', which may indicate a lack of consistency in the responses. An alpha of 0.65–0.80 is considered 'adequate' for a scale used in human dimension research (Vaske et al. 2017).

The results of the analysis of variance confirmed significant gaps between the perceived importance and effectiveness of CES. Zoderer et al. (2016) note that people's cultural background is an important factor in determining their perception of the importance of CES. However, the main landscape types have a greater impact on the sociocultural assessment of respondents in the ES categories.

Table 2. Cultural ecosystem services of NNP Shatskyi.

Cultural ecosystem services		Importance			Satisfaction		
		Average	Mean square	Cronbach's alpha	Average	Mean square	Cronbach's alpha
A	Aesthetics	4.77	0.490	0.831	4.51	0.781	0.824
B	Recreation	4.49	0.781	0.832	4.57	0.917	0.809
C	Knowledge of nature	4.29	1.073	0.826	4.40	0.775	0.840
D	Social relations	3.46	1.094	0.820	3.71	0.860	0.808
E	Cultural legacy	3.60	1.241	0.792	3.83	0.954	0.810
F	Inspiration	4.14	1.033	0.806	4.34	0.804	0.820
G	Sense of place	3.66	1.282	0.794	4.09	0.951	0.832
H	Spiritual or religious enrichment	3.11	1.231	0.803	3.40	0.976	0.817
Total (<i>n</i> = 35)		3.94	1.028	0.813	4.11	0.877	0.820

Table 3. Cultural ecosystem services of DP 'Bereznivskiy'.

Cultural ecosystem services		Importance			Satisfaction		
		Average	Mean square	Cronbach's alpha	Average	Mean square	Cronbach's alpha
A	Aesthetics	4.56	0.695	0.742	4.11	0.820	0.549
B	Recreation	4.44	0.773	0.706	4.31	0.889	0.490
C	Knowledge of nature	4.47	0.774	0.730	4.31	0.749	0.612
D	Social relations	4.19	1.009	0.673	4.17	0.811	0.577
E	Cultural legacy	3.81	1.117	0.731	4.28	0.815	0.658
F	Inspiration	4.39	0.766	0.756	4.11	0.887	0.573
G	Sense of place	4.03	1.055	0.750	4.06	0.893	0.570
H	Spiritual or religious enrichment	3.44	1.120	0.769	3.75	0.967	0.626
Total (<i>n</i> = 36)		4.17	0.914	0.732	4.14	0.854	0.582

Table 4. Cultural ecosystem services of the PMLA 'Horodnytskyj'.

Cultural ecosystem services		Importance			Satisfaction		
		Average	Mean square	Cronbach's alpha	Average	Mean square	Cronbach's alpha
A	Aesthetics	4.40	0.672	0.640	3.73	1.012	0.690
B	Recreation	4.58	0.675	0.620	4.10	0.928	0.708
C	Knowledge of nature	4.30	0.648	0.661	4.13	0.939	0.730
D	Social relations	3.95	0.876	0.615	3.78	1.074	0.697
E	Cultural legacy	4.20	0.823	0.668	3.65	1.122	0.724
F	Inspiration	4.25	0.776	0.606	3.90	0.928	0.744
G	Sense of place	4.23	0.768	0.619	3.95	0.959	0.749
H	Spiritual or religious enrichment	3.78	1.025	0.751	3.83	0.903	0.746
Total (<i>n</i> = 40)		4.21	0.783	0.648	3.88	0.983	0.724

Table 5. Cultural ecosystem services of the PMLA 'Myklukho-Maklai'.

Cultural ecosystem services		Importance			Satisfaction		
		Average	Mean square	Cronbach's alpha	Average	Mean square	Cronbach's alpha
A	Aesthetics	4.29	0.708	0.629	4.29	0.708	0.872
B	Recreation	4.55	0.670	0.687	4.36	0.906	0.865
C	Knowledge of nature	4.19	0.634	0.650	4.21	0.871	0.862
D	Social relations	4.14	0.952	0.652	4.02	1.047	0.872
E	Cultural legacy	4.14	0.926	0.593	4.29	0.835	0.871
F	Inspiration	4.31	0.924	0.565	4.26	0.798	0.853

Cultural ecosystem services		Importance			Satisfaction		
		Average	Mean square	Cronbach's alpha	Average	Mean square	Cronbach's alpha
G	Sense of place	4.12	1.017	0.647	4.12	1.017	0.862
H	Spiritual or religious enrichment	3.21	1.353	0.682	3.64	1.144	0.860
Total ($n = 42$)		4.12	0.898	0.638	4.15	0.916	0.865

Table 6. Cultural ecosystem services of LP 'Hamarnia'.

Cultural ecosystem services		Importance			Satisfaction		
		Average	Mean square	Cronbach's alpha	Average	Mean square	Cronbach's alpha
A	Aesthetics	4.31	0.655	0.686	4.33	0.772	0.832
B	Recreation	4.23	0.777	0.660	4.41	0.751	0.811
C	Knowledge of nature	4.18	0.756	0.583	4.44	0.821	0.768
D	Social relations	3.85	0.961	0.631	4.03	0.986	0.791
E	Cultural legacy	4.36	0.707	0.677	4.36	0.707	0.796
F	Inspiration	4.46	0.942	0.589	4.38	0.907	0.774
G	Sense of place	4.33	0.955	0.564	4.28	0.857	0.770
H	Spiritual or religious enrichment	3.33	1.457	0.687	3.77	1.135	0.789
Total ($n = 39$)		4.13	0.901	0.635	4.25	0.867	0.791

Table 7. Cultural ecosystem services of the 'Olexandria' State DP.

Cultural ecosystem services		Importance			Satisfaction		
		Average	Mean square	Cronbach's alpha	Average	Mean square	Cronbach's alpha
A	Aesthetics	4.49	0.573	0.708	4.69	0.466	0.774
B	Recreation	4.67	0.579	0.727	4.80	0.524	0.787
C	Knowledge of nature	4.15	0.870	0.730	4.62	0.757	0.769
D	Social relations	3.24	1.232	0.732	3.84	0.918	0.756
E	Cultural legacy	4.22	0.832	0.710	4.53	0.604	0.765
F	Inspiration	4.24	0.922	0.682	4.51	0.717	0.758
G	Sense of place	3.65	1.142	0.697	3.96	1.036	0.757
H	Spiritual or religious enrichment	3.16	1.259	0.687	3.76	1.018	0.735
Total ($n = 55$)		3.98	0.921	0.737	4.34	0.612	0.787

The overall effectiveness of CES in four parks (NNP Shatskyi, PMLA 'Myklukho-Maklai', LP 'Hamarnia', the 'Olexandria' State DP) was higher than perceived importance (respectively 4.11, 4.15, 4.25, and 4.34 vs.) (3.94, 4.12, 4.13, and 3.98). Three of these parks are located in areas affected by the RAA. Dzyba and Saveliev (2023) obtained similar results in Kyiv, where overall satisfaction of with CES was higher (4.08 and 4.38) than perceived importance (3.69 and 3.92) of CES, highlighting the impact of the RAA.

In two parks located in relatively dangerous areas – DP 'Bereznivskyi' and PMLA 'Horodnytskyi' – respondents perceived the overall importance of CES (4.17 and 4.21) as higher than its effectiveness (4.14 and 3.88). Similar results were obtained by Gai et al. (2022b), who conducted a study during peacetime in a park in China, where the overall importance (4.299) of the CES perceived by all respondents was higher than satisfaction (3.613). Gai et al. (2022a) noted that the satisfaction by users of the CES of an urban park was generally lower than its importance regardless of style and design, because users had higher expectations of parks.

Elbakidze et al. (2025) examined the impact of the Russian invasion on the relationship between people and nature in three settlements in Kyiv region that were occupied by Russian troops and later liberated by the Ukrainian army, and found that ecosystem services play an important role and influence the emotional and spiritual connection of respondents with their natural environment. Therefore, private gardens and urban green spaces have become crucial elements for post-war recovery, promoting reconnection and psychological healing.

Among the six parks, the main CES

categories that influenced user satisfaction differ. In the 'Olexandria' State DP, PMLA 'Myklukho-Maklai', five categories of the 'supply and demand correspondence zone' were identified: Aesthetics (A), Recreation (B), Knowledge of nature (C), Cultural legacy (E), Inspiration (F). There are three categories in both DP 'Bereznivskyi' and PMLA 'Horodnytskyi', among which two categories are common (average value is greater 4.0): Recreation (B) and Knowledge of nature (C), and while the third category is different: Social relations (D) in DP 'Bereznivskyi' and Sense of place (G) in PMLA 'Horodnytskyi'. LP 'Hamarnia' had six categories: Aesthetics (A), Recreation (B), Knowledge of nature (C), Sense of place (G), Cultural legacy (E), Inspiration (F). NNP Shatskyi included four categories: Aesthetics (A), Recreation (B), Knowledge of nature (C), Inspiration (F). The importance and effectiveness of all these categories were relatively high (Table 2–7).

In each park, different CES categories influenced overall user satisfaction. Recreation (B) had the highest score in four parks, while Aesthetics (A) dominated in two parks, located in relatively safe areas. Similar results were reported by Peng et al. (2024), who found that aesthetic value is one of the CES most closely related to humans and important for national park management. In Kyiv, respondents also highly appreciated Aesthetics (A), Recreation (B), Knowledge of nature (C) (Dzyba and Saveliev 2023). Relaxation in parks during the war allows people to restore their mental state in natural silence.

The psychological well-being of urban and rural residents is partly linked to the proximity of green and blue spaces, street trees, and private gardens (Bratman et al. 2019). Van den Berg et al. (2019) note that green spaces within a 3 km radius provide

more effective recovery than those within 1 km, given sufficiently large green areas. Green spaces can provide a buffer against the negative impact of stressful life events on people's health. Short-term contact with nature, including physical activity and social interaction positively affects mental health (Hartig et al. 2014). Therefore, the mental health benefits can be considered 'co-benefits' alongside other ecosystem services (Bratman et al. 2019).

Peng et al. (2024) noted that visitors to national parks tend to prioritise natural, cultural, and social aesthetic CES. The perceived value of physical and mental health services was the highest (2.44), whereas spiritual services were the lowest (1.86). In Ukraine, visitors of the six parks also rated the category Spiritual lowest in terms of Satisfaction (3.40–3.83). Peng et al. (2024) further observed that different demographic characteristics significantly affect the perception of aesthetic values. However, in contrast to respondents from Chinese parks, visitors to Ukrainian parks evaluated Spiritual (H) as the least important among CES (3.11–3.78, tables 2–7). It can be assumed that the war has influenced spirituality – understood as the search for meaning and purpose in life – by prompting people to reassess their values, beliefs, and place in the world. During the RAA, Inspiration (F) became important for personal development, work, and study. Visitors in all six parks also emphasised the relative importance of this category (4.14–4.46, tables 2–7), indicating its strong contribution to overall satisfaction. In historical parks in China, among 14 CES, Sense of place and Relaxation were reported as most important (Dai et al. 2024). Similarly, in Ukrainian historical parks – the 'Olexandria' State DP, PMLA 'Horodnytskyi', PMLA 'Myklukho-Maklai', and LP 'Hamarnia' – Sense of place (G)

had moderate importance and impact on visitors. The highest score was recorded in LP 'Hamarnia' (4.33), likely because most respondents had lived in the area since childhood, which strengthens their emotional attachment to the landscape.

In urbanised areas, visitors rated cultural heritage and education as most important CES, while aesthetic and recreational services were in highest demand. In moderately urbanised small cities, the demand for Recreation (B) and Social relations (D) was lower (Xia et al. 2024). The studied parks are located in small cities with moderate urbanisation. Social relations (D) were generally rated low (3.24–3.95) except in PMLA 'Myklukho-Maklai' and DP 'Bereznivskyi' (4.14–4.19), indicating that the war did not affect social interactions. CES preferences also depend on stand composition: *Pinus sylvestris* stands emphasise aesthetic and cultural legacy, while in broad-leaved stands favour recreation and intellectual services (Bhatt et al. 2024). Broadleaved mixed-age stands with centuries-old *Quercus robur* provide CES and generate the largest current ES increment (Feshchenko et al. 2023).

In studied parks, respondents were divided into five age groups to compare differences in the perception of the effectiveness (satisfaction) of the eight CES categories among these age groups. Among the respondents, clear differences were observed between younger and older visitors in each park (Fig. 3).

The highest levels of satisfaction were reported by visitors aged 31–40 in LP 'Hamarnia' and PMLA 'Myklukho-Maklai', and by those aged 41–50 in DP 'Bereznivskyi' and PMLA 'Horodnytskyi'. In the NNP Shatskyi, the 51–64 age group recorded the highest scores, whereas in the 'Olexandria' State DP, the most satisfied visitors were aged 64 and older.

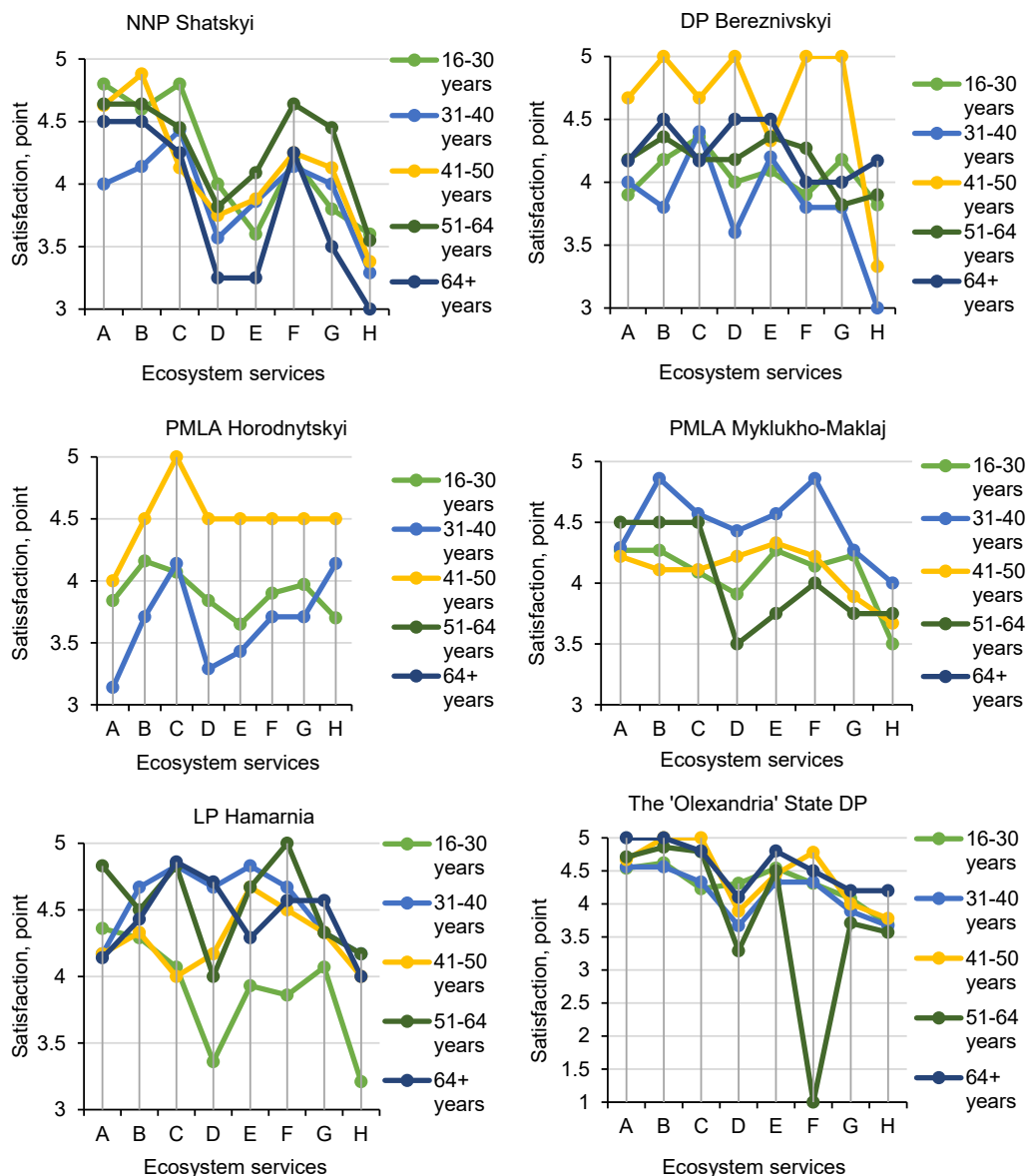


Fig. 3. Satisfaction with cultural ecosystem services by age group in the PMLAs, NNP, DPs, and LP.

Note: A – aesthetics, B – recreation, C – knowledge of nature, D – social relations, E – cultural legacy, F – inspiration, G – sense of place, H – spiritual or religious enrichment.

These results suggest that middle-aged and older people tend to have a more positive perception of CES in parks.

In contrast, the youngest age group (16–30) in all parks reported only moderate satisfaction with CES. They pointed out

the need to improve the quality and diversity of CES. Suggested improvements included: infrastructure improved in several parks and lighting (DP 'Bereznivskiy'), the provision of art and educational events, ecological competitions and quests, art readings (DP 'Bereznivskiy'), creation of information boards with park maps, development of ecological trail (NNP Shatskiy, DP 'Bereznivskiy', LP 'Hamarnia', as well as increased species diversity (NNP Shatskiy, PMLA 'Myklukho-Maklai').

Least satisfied with CES in NNP Shatskiy were visitors aged 64 and over. In PMLA 'Myklukho-Maklai' and the 'Olexandria' State DP, the lowest satisfaction was reported among the 51–64 age group. In DP 'Bereznivskiy' and PMLA 'Horodnytskyi', it was the 31–40 age group, while in LP 'Hamarnia', the youngest respondents aged 16–30 expressed lowest satisfaction (Fig. 3). These results suggest that older visitors (51 and older) may require more accessible infrastructure and a greater number of comfortable resting areas. In contrast, younger respondents (16–30-year-old) tend to expect better-maintained green spaces and more opportunities for active or social leisure within the park.

The type of services offered depends on the physical characteristics of ecosystems (Hegetschweiler et al. 2017). Five parks include reservoirs, except for the DP 'Bereznivskiy', where the fountain cascade is currently non-functional. The presence of water bodies plays a significant role in the effectiveness of cultural ecosystem services. Quevedo and Kohsaka (2024) noted that the provision of CES depends on blue carbon ecosystems, as their degradation leads to the loss or reduction of CES and associated benefits, ultimately affecting community well-being and health.

In the DP 'Bereznivskiy', respondents

indicated a desire to see the restoration of the fountain, while in the NNP Shatskiy they emphasised the need to improve the coastal areas of the Shatskiy lakes for recreation, which confirms the opinion of scientists about the importance of reservoirs as integral elements of CES. Coastal ecosystems provide a wide range of ecosystem services and benefits that contribute to local livelihoods, food security, and overall well-being (Himes-Cornell et al. 2018).

Hua and Chen (2019) noted, based on a systematic analysis of community perceptions, that for respondents in South China, the perceived importance of CES of urban rivers was generally higher than their satisfaction levels. We agree with Quevedo and Kohsaka (2024), who emphasise the need to integrate CES into local management and restoration strategies, especially given the growing importance of blue carbon ecosystems for global climate change mitigation. Improving the institutional and legal frameworks for the management, control and regulation of waterscapes and developing ecological restoration options will enhance the long-term values of CES (Barbier et al. 2011). Himes-Cornell et al. (2018) also recommend focusing on expanding valuable ecosystem services and increasing their valuation in underrepresented regions.

From 15.4 % to 94.4 % of respondents in six Ukrainian parks – particularly in areas more significantly affected by the RAA – expressed a desire for improved infrastructure and landscaping. The most frequent requests concerned enhancing aesthetics through the installation of additional benches, waste bins, gazebos, playgrounds, and restrooms (notably in DP 'Bereznivskiy', PMLA 'Myklukho-Maklai', and the 'Olexandria' State DP). Visitors also suggested restoring non-func-

tional fountains (in DP 'Bereznivskiy' and PMLA 'Horodnytskyj'), and creating new flower beds to enhance visual appeal (in PMLA 'Myklukho-Maklai' and 'Olexandria' State DP).

The highest number of proposals was recorded in Shatskyi National Park, where respondents highlighted the need for additional information stands about rare plants and cultural heritage, greater dendrological diversity through the introduction of exotic tree species, creation of photo zones, construction of children's and sports areas, and installation of gazebos and an electronic species indicator. They also expressed a wish for overall park modernisation through contemporary landscape design.

Approximately 5 % of visitors in each park reported being satisfied with the current conditions and did not propose any changes.

Elbakidze et al. (2025) note that post-conflict recovery strategies should prioritise the restoration of ecosystem services and cultural and spiritual connections between people and nature. Analysis of the spatial integration of socio-cultural values will provide an opportunity to predict the consequences of landscape changes and develop recommendations for future landscape planning (Zoderer et al. 2016). In the post-conflict period, which is a critical stage, it is necessary to prioritise biodiversity conservation in recovery and reconstruction policies, natural resource management, protected areas, and the establishment of transboundary peace parks (Hanson 2018).

Conclusions

Protected parks in Ukraine serve as valuable centres for the provision of cultural

ecosystem services. During the RAA, when many people experience stress, these parks provide spaces for restoring well-being and fostering connection with nature. Visitors expressed a preference for secluded natural areas. Overall satisfaction with and perceived importance of CES depend on the influence of RAA. Respondents in parks located in relatively dangerous areas greater importance to CES than their satisfaction with them. Among the eight CES categories, Recreation (B) scored highest in both importance and satisfaction across six parks, while Aesthetics (A) ranked highest in two parks situated in relatively dangerous areas. CES categories, such as Spiritual (H) and Social relations (D), were generally considered less important.

The obtained data can be utilised by communities to enhance park habitats. The CES provided by parks can serve as a foundation for the sustainable management, development, or restoration of blue carbon ecosystems. In the post-war period, taking into account CES, such as recreation and tourism, it is crucial to prioritise the restoration of blue carbon ecosystems within parks. The rehabilitation of damaged or neglected park areas in local communities, with due consideration of cultural values, is highly valued by the public.

References

- BARBIER E.B., HACKER S.D., KENNEDY C., KOCH E., STIER A.C., SILLIMAN B.R. 2011. The value of estuarine and coastal ecosystem services. *Ecological Monographs* 81(2): 169–193. <https://doi.org/10.1890/10-1510.1>
- BHATT H., JUGRAN H.P., PANDEY R. 2024. Cultural ecosystem services nexus with Socio-Cultural attributes and traditional

- ecological knowledge for managing community forests of Indian western Himalaya, *Ecological Indicators* 166, 112379. <https://doi.org/10.1016/j.ecolind.2024.112379>
- BRATMAN G.N., ANDERSON C.B., BERMAN M.G., COCHRAN B., DE VRIES S., FLANDERS J. ET AL. 2019. Nature and mental health: An ecosystem service perspective. *Science advances* 5(7), eaax0903. doi: 10.1126/sciadv.aax0903
- DAI D., CHEN Y., DAI K. 2024. Evaluating cultural ecosystem services in China's modern historic parks: A sentiment computing approach. *Urban Forestry & Urban Greening* 95, 128314, <https://doi.org/10.1016/j.ufug.2024.128314>
- DUDLEY J.P., GINSBERG J.R., PLUMPTRE A.J., HART J.A., CAMPOS L.C. 2002. Effects of War and Civil Strife on Wildlife and Wildlife Habitats. *Conservation Biology* 16(2): 319–329. <http://www.jstor.org/stable/3061358>
- DZYBA A., SABELIEV K. 2023. THE IMPORTANCE AND THE EFFECTIVENESS OF CULTURAL ECOSYSTEM SERVICES PROVIDED BY PARKS IN THE CITY OF KYIV DURING THE WAR IN UKRAINE. *UKRAINIAN JOURNAL OF FOREST AND WOOD SCIENCE* 14(2): 38–52. <https://doi.org/10.31548/FOREST/2.2023.38>
- ELBAKIDZE M., KUNS B., GUNKO R., KRULOV I., MASLYUKIVSKA O., KARAMUSHKA V., ADAMENKO O., HOLUB O., KLEBA L., MELNYK Y., MYLYSIUK Y., PIDUST O., SLOBODIAN I., TKACHENKO Y., YAMELYNETS T. 2025. Understanding the impact of the war on people-nature relationships in Ukraine. *Ecosystem Services* 73, 101725. <https://doi.org/10.1016/j.ecoser.2025.101725>
- FERGUSON M.D., ROBINSON T., FERGUSON L.A., EVENSEN D., SCHWARTZ F., GONYO S., FREITAG A. 2023. Cultivating commitment: how cultural ecosystem services affect visitor loyalty attitudes and intention-to-return in parks and protected areas. *Ecosystems and People* 20(1): 1–15. <https://doi.org/10.1080/26395916.2023.2297560>
- FESHCHENKO R., KOVBASA Y.A., MATASHUK R., BILOUS S., NAUMOVSKA O., BILOUS A. 2023. Current increment of ecosystem services in permanent sample plots within the forest stands of the Feofania park-monument. *Ukrainian Journal of Forest and Wood Science* 14(4): 88–102. <https://doi.org/10.31548/forest/4.2023.88>
- GAO S., FU J., RONG X., DAI L. 2022a. Importance–performance analysis and improvement of an urban park's cultural ecosystem services based on users' perspectives: A Beijing case study. *Journal of Asian Architecture and Building Engineering* 22(2): 726–739. <https://doi.org/10.1080/13467581.2022.2049800>
- GAO S., FU J., RONG X., DAI L. 2022b. Users' views on cultural ecosystem services of urban parks: An importance-performance analysis of a case in Beijing, China. *Anthropocene* 37, 100323. <https://doi.org/10.1016/j.ancene.2022.100323>
- GALKIN S.I. 2012. Dendrological Park 'Olexandria' of the NAS of Ukraine (history and present day). Bila Tserkva: O. V. Pshonkivskyi. 104 p. (in Ukrainian).
- GAN Q., LIAO L., KANG X., XU Z., FU T., CAO Y., FENG Y., DONG J., LAN S. 2024. Cultural Ecosystem Services and Disservices in Protected Areas: Hotspots and Influencing Factors Based on Tourists' Digital Footprints. 38 p. Available at: <http://dx.doi.org/10.2139/ssrn.4724607>
- GRZYB T. 2024. Mapping cultural ecosystem services of the urban riverscapes: the case of the Vistula River in Warsaw, Poland. *Ecosystem Services* 65, 101584. <https://doi.org/10.1016/j.ecoser.2023.101584>
- HANSON T. 2018. Biodiversity conservation and armed conflict: a warfare ecology perspective. *Annals of the New York Academy of Sciences* 1429(1): 50–65. <https://doi.org/10.1111/nyas.13689>
- HARTIG T., MITCHELL R., DE VRIES S., FRUMKIN H. 2014. Nature and health. *Annual Review of Public Health* 35: 207–228. <https://doi.org/10.1146/annurev-publhealth-032013-182443>
- HAVINGA I., MARCOS D., BOGAART P., TUIA D., HEIN L. 2024. Understanding the sentiment associated with cultural ecosystem services using images and text from social media. *Ecosystem Services* 65, 101581. <https://doi.org/10.1016/j.ecoser.2023.101581>
- HEGETSCHWEILER K.T., DE VRIES S., ARN-

- BERGER A., BELL S., BRENNAN M., SITER N., OLAFSSON A.S., VOIGT A., HUNZIKER M. 2017. Linking demand and supply factors in identifying cultural ecosystem services of urban green infrastructures: A review of European studies. *Urban Forestry and Urban Greening* 21: 48–59. <https://doi.org/10.1016/j.ufug.2016.11.002>
- HIMES-CORNELL A., PENDLETON L., ATIYAH P. 2018. Valuing ecosystem services from blue forests: A systematic review of the valuation of salt marshes, sea grass beds and mangrove forests. *Ecosystem Services* 30(A): 36–48. <https://doi.org/10.1016/j.ecoser.2018.01.006>
- HUA J., CHEN W.Y. 2019. Prioritizing urban rivers' ecosystem services: an importance-performance analysis. *Cities* 94: 11–23. <https://doi.org/10.1016/j.cities.2019.05.014>
- HUANG S., XIAO X., TIAN T., CHE Y. 2024. Seasonal influences on preferences for urban blue-green spaces: Integrating land surface temperature into the assessment of cultural ecosystem service value. *Sustainable Cities and Society* 102, 105237. <https://doi.org/10.1016/j.scs.2024.105237>
- LI J., GAO J., ZHANG Z., FU J., SHAO G., ZHAO Z., YANG P. 2024. Insights into citizens' experiences of cultural ecosystem services in urban green spaces based on social media analytics. *Landscape and Urban Planning* 244, 104999. <https://doi.org/10.1016/j.landurbplan.2023.104999>
- MALYN CITY COUNCIL 2025. Myklukho-Maklai City Park of Culture and Recreation. (in Ukrainian). Available at: <https://malyn-rada.gov.ua/catalog/parky-malyna-ta-miscya-rekreaciyi/miskyy-park-kultury-i-vidpochynku-im-mykluhy-maklaya>
- MARKOV F.F., VYSHNEVSKYI A.V. 2013. Comprehensive assessment of Miclouho-Maclay park, the monument of landscape art. *Scientific Bulletin of UNFU* 23(13): 41–47 (in Ukrainian).
- OLEKSIICHENKO N.O., PODOLKHOVA M.O., KURDIUK O.M. 2019. Dendrological parks of Ukrainian Polissia. *Bila Tserkva: O. V. Pshonkivskyi*. 251 p. (in Ukrainian).
- PENG W., NAN L., TING M., YOUJUN H., LE L., ZHUDI L. 2024. Research on a Cultural Ecosystem Service Evaluation System for National Parks: An Analysis based on Tourists' Perception of Aesthetic Value. *Journal of Resources and Ecology* 15(6): 1–13. doi: 10.5814/j.issn.1674-764x.2024.06.005
- PINTO L.V., INÁCIO M., BOGDZEVICH K., GOMES E., PEREIRA P. 2024. Factors affecting the use of cultural ecosystem services in Lithuanian coastal area. *Ocean & Coastal Management* 251, 107095. <https://doi.org/10.1016/j.ocecoaman.2024.107095>
- QUEVEDO J., KOHSAKA R. 2024. A systematic review of cultural ecosystem services of blue carbon ecosystems: Trends, gaps, and challenges in Asia and beyond. *Marine Policy* 159, 105898. <https://doi.org/10.1016/j.marpol.2023.105898>
- SHATSKY NATIONAL NATURE PARK 2025. Web site of the Shatskyi National Nature Park (in Ukrainian). Available at: <https://shnp.forest.gov.ua>
- SONG L., WU M., WU Y., XU X., XIE C. 2023. Research on the Evaluation of Cultural Ecosystem Services in Zhengzhou Urban Parks Based on Public Perceptions. *Sustainability* 15(15), 11964. <https://doi.org/10.3390/su151511964>
- VAN DEN BERG A.E., MAAS J., VERHEIJ R.A., GROENEWEGEN P.P. 2010. Green space as a buffer between stressful life events and health. *Social Science & Medicine* 70(8): 1203–1210. <https://doi.org/10.1016/j.socscimed.2010.01.002>
- VASKE J.J., BEAMAN J., SPONARSKI C.C. 2017. Rethinking internal consistency in Cronbach's alpha. *Leisure Sciences* 39(2): 163–173. <https://doi.org/10.1080/01490400.2015.1127189>
- WMA (WORLD MEDICAL ASSOCIATION) 2013. Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. Available at: <https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>
- WWF UKRAINE 2023. The impact of war on protected areas of Ukraine. (in Ukrainian). Available at: <https://wwf.ua/?12163316/The-impact-of-war-on-protected-areas-in->

Ukraine

- XIA Z., WANG Y., LU Q., SHEN Z., LIU K., WEI X., YUAN C., GAO Y., LIU L. 2024. Understanding residents' perspectives on cultural ecosystem service supply, demand and subjective well-being in rapidly urbanizing landscapes: a case study of peri-urban Shanghai. *Landscape Ecology* 39, 22. <https://doi.org/10.1007/s10980-024-01820-4>
- YANG Y., DUAN W. 2024. An Interpretation of Landscape Preferences Based on Geographic and Social Media Data to Understand Different Cultural Ecosystem Services. *Land* 13(2), 125. <https://doi.org/10.3390/land13020125>
- ZODERER B., STANGHELLINI P., TASSER E., WALDE J., WIESER H., TAPPEINER U. 2016. Exploring socio-cultural values of ecosystem service categories in the Central Alps: the influence of socio-demographic factors and landscape type. *Regional Environmental Change* 16(7): 2033–2044. <https://doi.org/10.1007/s10113-015-0922-y>