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Characteristics of the Forest Fund of Ukrainian Polissia

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Abstract. The study examines the spatial and forestry structure of the Ukrainian Polissia forest fund based on forest management materials from four branches of the State Specialised Forest Enterprise «Forests of Ukraine»: «Poliskyi Forest Office», «Pivnichnyi Forest Office», «Stolychnyi Forest Office» and «Podilskyi Forest Office». The methodology included several stages: spatial analysis using GIS tools and forest management materials to determine administrative units within the natural zone of Polissia; creation of a database based on key taxation indicators (species composition, forest site conditions, forest stand origin, age class, forest site conditions class); analytical summarisation of the structure of forests by administrative units. The study determined that natural forests predominate (52% of the area), but their share varies by region. The dominant species is Scots pine, which occupies approximately 63% of the total area. A high mosaic pattern of forest site conditions was identified, with a predominance of fairly poor and fairly rich forest types site conditions. The structure is dominated by high-level site conditions class plantations (class I and above, 58% of

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the area). Certain patterns were identified in the forest inventory structure, which are associated with an increase in the continentality of the climate from west to east, namely: an increase in the proportion of artificial plantations, a change in the predominance of moist and wet hygrotypes to fresh ones, a decrease in the proportion of softwood species in the composition, an increase in forest productivity, and an increase in the proportion of maturing and mature tree stands. The results of the study can be used to optimise forest resource management, develop regional strategies for sustainable forest use and preserve the ecosystem stability of the Polissia forests

Keywords: forest stand origin; forest site conditions; forest productivity; spatial analysis; GIS

INTRODUCTION

The forest fund, as a collection of land covered with forest vegetation and intended for forestry, is a significant component of the natural resource potential of any country, including Ukraine. In the context of growing environmental challenges, including climate change, biodiversity loss and intense anthropogenic pressure, a detailed study of the structure, spatial organisation and functional state of forests in individual natural-geographical regions requires special scientific attention. The forest fund is a fundamental component of the natural resource potential of European countries, supporting biodiversity, regulating the climate, and providing ecosystem services. According to the European Environment Agency (EEA), forests cover about 160 million hectares, which is approximately 39% of the EU's area, and more than 90% of these forests are semi-natural, while primary and old-growth forests account for less than 4% (European Parliament, 2022). According to H. Mauser (2023), between 1961 and 2020, forest cover in EU countries increased by 37%, timber stocks grew by 138% and productivity by 95%. Forecasts indicate that the forest area will continue to grow as a result of sustainable forest management and natural regeneration. The creation of new forests through afforestation programmes and the spontaneous reforestation of low-productivity land are also contributing to this trend (Corticeiro *et al*., 2024).

However, forest ecosystems are currently facing a range of challenges, the most significant of which are climate change, intensified logging, droughts, forest fires, mass outbreaks of pests and destructive windstorms. According to the results of a large-scale review by Z. Vacek *et al.* (2023), the effects of climate change are manifested in pronounced regional asymmetry in productivity: in southern Europe, growth rates are declining by 1249%, while in northern regions, on the contrary, there is an almost twofold increase (+99%). Such spatially heterogeneous dynamics indicate the need for regionally differentiated forest management strategies, as universal approaches are losing their effectiveness. In addition to changes in growth rates, the structure of degradation factors is also undergoing a significant transformation. According to data from the European Environment Agency (2023), the share of fires, storms and mass pest outbreaks in the structure of destructive factors for European forests has effectively doubled over the last decade. This indicates not only an increase in the vulnerability of ecosystems but also the cumulative effect of climate stress, which makes forests more prone to catastrophic disturbances. A key tool for monitoring forest conditions and forecasting these trends is the Global Forest Resources Assessment (FRA), which covers the period from 1990 to 2025 and includes more than 60 indicators, including forest area, biomass volumes, annual growth, ownership structure and sustainability characteristics (FAO, 2025). A unique advantage of the FRA is the comparability of data between countries, but its limitation remains the high aggregation of indicators, which limits analysis of regional characteristics. To overcome this shortcoming, studies conducted highly detailed spatial analysis. For example, V. Avitabile *et al*. (2024) presented harmonised statistical series and maps of biomass and annual wood growth with a resolution of up to 100 m across 38 European countries. These results significantly contribute to analysis of regional variability and provide a basis for adapting management decisions at the national and local levels. However, even these maps are not always able to reflect micro-scale processes, in particular local differences in soil and hydrological conditions, which maintains the need to combine global and local data.

Ukrainian Polissia is one of the most forested regions of the country, where forests combine relevant economic functions with a critical ecological role in maintaining the hydrological balance and preserving biodiversity. Unique climatic, soil and hydrological conditions determine the formation of specific types of forest ecosystems. The predominance of pine and sub-pine forests, a significant proportion of marshy and peaty lands, as well as the mosaic nature of the landscapes, create a complex spatial structure of the forest fund, which requires in-depth analysis and differentiated approaches to management. Climatic studies by S. Boychenko *et al.* (2025) showed that during the period 1990-2021, the average annual temperature in Polissia increased by 0.60 ± 0.08°C per decade, while precipitation decreased by approximately 6 mm. This trend not only increases the risk of summer droughts but also leads to a gradual transformation of forest growing conditions. A significant consequence of this process is a decrease in the groundwater level. As noted by S. Sydorenko *et al.* (2024), the combination of lower

soil moisture and the dominance of pine plantations create particularly favourable conditions for the occurrence and spread of fires, confirming Polissia's high vulnerability to climate-related threats.

The study aimed to provide a scientifically substantiated description of the forest fund of the Ukrainian Polissia region, including an analysis of its area, age structure, species composition of tree stands, origin, types of forest site conditions, and productivity.

MATERIALS AND METHODS

The research was based on forest management data from the last audit period (basic forest management 2014-2025) for the structural divisions of four branches of the State Enterprise (SE) "Forests of Ukraine": "Poliskyi Forest Office", "Pivnichnyi Forest Office", "Stolychnyi Forest Office" and "Podilskyi Forest Office". At the first stage of the study, a geospatial analysis was conducted to identify the divisions of the branches located within the Ukrainian Polissia region according to the comprehensive forest management zoning (Hensiruk, 1991). The geospatial analysis was conducted using the "Forests of Ukraine" geoportal and the Geoinformation System for Forest Resource Management (State Forest Resources Agency of Ukraine, n.d.). When using the "Forests of Ukraine" geoportal, the territorial affiliation of the unit was assessed using the "Map" tab and the "Plantations" section in the context of four interregional administrations: North-Western, Central, Northern and South-Western. The geographic information system for forest resource management was used as a cartographic basis for determining the correspondence of the territory of forest districts to the Ukrainian Polissia zone. For this purpose, the layers "Region of distribution (forestry zoning)", "Quarters" and "Allotments" were used in the "Permanent forest seed base" section. The forest fund of all Forestry Management Unit, with the exception of Baranivske, Volodymyr-Volynske, Korostyshivske, Makarivske, Nizhynske and Shepetivske, was completely attributed to the Ukrainian Polissia. In the second stage of the study, a sample was formed based on such inventory indicators as tree species composition, types of forest site conditions, forest stand origin, age class, and forest site conditions class. The indicators of the structural subdivision of the Forestry Management Unit served as a sampling option. The source of information was the forest management information database of the Ukrainian Research Institute of Forestry and Agroforestry (n.d.). In cases where only part of the Forestry Management Unit territory (Baranivske, Volodymyr-Volynske, Korostyshivske, Makarivske, Nizhynske and Shepetivske) belonged to the natural zone of the Ukrainian Polissia, the analysis of forest management information was conducted using data from the relational database of the Ukrderzhlesproekt Production Association for 2017, using the Lisovporadnyk geoinformation system. The database query was performed using the following algorithm: "SQL" → "Allocation area" (grouping/sum) → "Plant growth conditions" ("Main species", "Bonitet class", "Type of forest growing conditions", "Age group") → "Characteristics of tree species components" ("Sequential number of tree species" – 1, "Origin"). Forest stand origin (artificial or natural) was determined by the main species in the main stand storey. The average site conditions class was calculated as a weighted average (sum of the products of areas and site conditions class / total area). At the third stage, the forest fund data was analysed and interpreted in terms of Forestry Management Unit and Branches. The processing and analysis of forest management materials were conducted following the instructions in force in Ukraine (Instruction for forest management of forest fund in Ukraine, 2006). Mathematical processing of data arrays was conducted using Excel.

RESULTS

Territorially, the Ukrainian Polissia zone includes forest areas belonging to four branches of the State Enterprise "Forests of Ukraine": "Poliskyi Forest Office" – 1.08 million hectares (46%) of forested land, "Stolychnyi Forest Office" – almost 0.79 million hectares (34%), "Pivnichnyi Forest Office" – over 0.45 million hectares (19%) and "Podilskyi Forest Office" – 0.03 million hectares (1%). The Branch "Poliskyi Forest Office" has 15 of the 16 forest districts within the Ukrainian Polissia region under its jurisdiction (Table 1).

***Table 1**. Areas of forest plantations of the Forestry Management Unit of the Branch "Poliskyi Forest Office", belonging to the Ukrainian Polissia*

Forestry Management Unit	Area of forested land, thousand hectares		Proportion of natural tree stands, %
	Total	Including artificial	
Volodymyr-Volynske	58.2	26.9	53.9
Kivertsivske	108.7	46.7	57.0
Manevytske	70.7	30.4	57.0
Liubeshivske	45.0	11.8	73.8
Kamin-Kashyrske	71.7	27.0	62.4
Ratnivske	43.4	19.3	55.6
Liubomlske	71.7	29.3	59.2
Kovelske	58.2	22.2	61.8

Table 1. Continued

Forestry Management Unit	Area of forested land, thousand hectares		Proportion of natural tree stands, %
	Total	Including artificial	
Vysotske	70.0	23.5	66.5
Kostopilske	75.4	42.0	44.3
Rafalivske	81.7	29.8	63.5
Sarnenske	93.1	39.9	57.1
Klesivske	139.1	44.4	68.1
Bereznivske	47.3	18.0	61.9
Sosnivske	44.9	17.4	61.1
Total	1079.3	428.6	60.3

Source: *compiled by the authors*

The Dubenske Forestry Management Unit and the southern part of the Volodymyr-Volynske Forestry Management Unit belong to the Forest-Steppe. In the forest fund of all Forestry Management Units except Kostopilske, natural tree stands prevail in terms of area. Of the 15 structural units of the Branch "Stolychnyi Forest Office", only 12 belong to the Ukrainian Polissia. Natural tree stands predominate in terms of area only in the forest districts in the north of Zhytomyr Region (Table 2).

Table 2*. Areas of forest plantations of the Forestry Management Unit of the Branch "Stolychnyi Forest Office", which belong to the Ukrainian Polissia*

Forestry Management Unit	Area of forested land, thousand hectares		Proportion of natural tree stands, %
	Total	Including artificial	
Baranivske	37.9	24.9	34.2
Bilokorovytske	106.9	35.4	66.9
Zviahelske	104.7	39.8	61.9
Slovechanske	66.1	28.9	56.3
Ovrutske	130.6	55.2	57.8
Radomyshlske	49.1	34.5	29.8
Korostenske	109.2	43.7	60.0
Korostyshivske	20.6	13.6	34.2
Ivankivske	53.5	33.9	36.6
Dymerske	53.4	32.1	40.0
Teterivske	32.1	24.2	24.6
Makarivske	23.4	15.6	33.1
Total	787.6	381.8	51.5

Source: *compiled by the authors*

The Boryspilske, Bilotserkivske, and Bohuslavske Forestry Management Unit belong to the Forest-Steppe zone. The southern parts of the Baranivske, Korostyshive, and Makarivske Forestry Management Unit also belong to this natural zone. Of the nine structural units of the Branch "Pivnichnyi Forest Office", only seven can be attributed to the Ukrainian Polissia (Table 3).

Table 3*. Forest areas of the Forestry Management Unit of the Branch "Pivnichnyi Forest Office" and Branch "Podilskyi Forest Office", which are part of the Ukrainian Polissia region*

Forestry Management Unit	Area of forested land, thousand hectares		Proportion of natural tree stands, %
	Total	Including artificial	
Branch "Pivnichnyi Forest Office"			
Shostkynske	83.4	62.5	25.1
Konotopske	42.3	26.1	38.2
Chernihivske	90.8	58.2	35.9
Koriukivske	70.6	44.6	36.9
Nizhynske	42.0	24.7	41.3
Novhorod-Siverske	56.9	42.0	26.2
Horodnianske	68.7	39.9	42.0
Total	454.8	298.0	34.5

Table 3. Continued

Forestry Management Unit	Area of forested land, thousand hectares		Proportion of natural tree stands, %
	Total	Including artificial	
Branch "Podilskyi Forest Office"			
Shepetivske	32.4	18.1	44.2

Source: *compiled by the authors*

In addition to the Sumske and Trostyanetske Forestry Management Unit, the southern part of the Nizhynske Forestry Management Unit is also not part of Polissia. In the forest fund of the Branch "Podilskyi Forest Office", only the western part of the Shepetivske Forestry Management Unit can be attributed to the natural zone of Polissia in Ukraine. The forest plantations of all structural units of both species, without exception, are predominantly of artificial origin. In general, natural tree stands dominate in the forests of Ukrainian Polissia, accounting for 52% of the forested land. While natural forests account for 60% of the forest areas of the Branch "Poliskyi Forest Office", they cover only 34% of the areas of the Northern Forestry (Fig. 1).

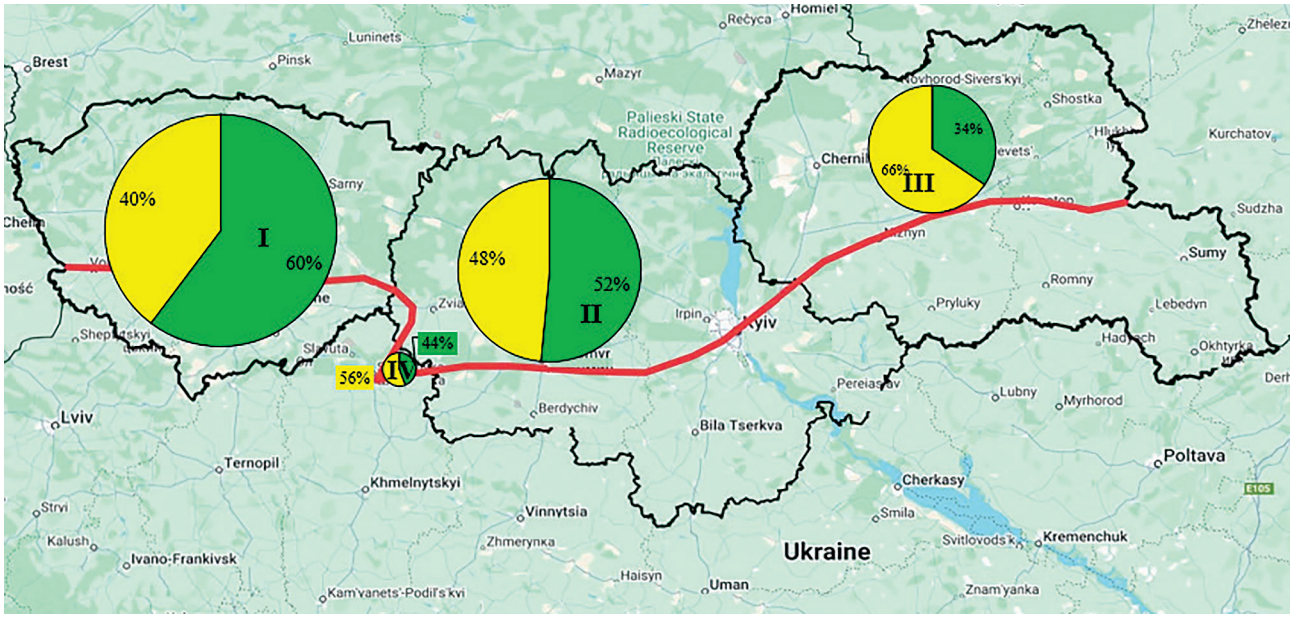

Figure 1*. Distribution of forest areas belonging to branches of the State Enterprise "Forests of Ukraine" located in the Ukrainian Polissia region, by origin*
Note: *yellow colour – artificial forests, green – natural forests. I – Branch "Poliskyi Forest Office", II – Branch "Stolychnyi Forest Office", III – Branch "Pivnichnyi Forest Office", IV – Branch "Podilskyi Forest Office"*
Source: *compiled by the authors*

In the forests of the Ukrainian Polissia, the proportion of poor forest site conditions is slightly more than 12% of the area, with fresh poor conditions being the most common at almost 8%. The proportion of fairly poor forest site conditions is significantly greater than 50%. The most common types of forest site among fairly poor conditions are fresh and moist, accounting for 23% and 19% respectively. Fairly rich forest site conditions are quite common, covering more than 34% of the area, including moist fairly rich conditions (almost 15%) and fresh and wet fairly rich conditions (more than 9% each). Fairly rich forest site conditions are the least common in Polissia, covering only 3% of the area, of which fresh fairly rich conditions accounts for almost 2% and moist suhrud for more than 1% (Fig. 2).

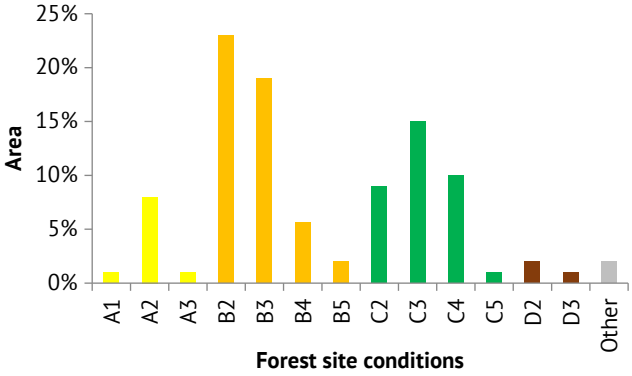

Figure 2*. Distribution of forest areas in the Ukrainian Polissia region by type of forest site conditions*
Source: *compiled by the authors*

Within Polissia, the most common forest conditions (poor) are found in the forests of the Branch "Poliskyi Forest Office", covering almost 16% of the area. In the Branch "Stolychnyi Forest Office", poor forest site conditions account for 11% of the area, and in the Branch "Pivnichnyi Forest Office", 7%. In the forests of the Branch "Podilskyi Forest Office", the share of pine forest conditions is insignificant. Fairly poor forest site conditions are the dominant trophic habitat in the three largest branches in terms of area, representing the natural zone. The share of fairly poor forest site conditions from 47% in the Branch "Poliskyi Forest Office" to 54% in the Branch "Stolychnyi Forest Office". In the Polissia part of the Branch "Podilskyi Forest Office", fairly poor forest site conditions occupies only 32%, while the most common here are fairly rich forest site conditions, which account for 63% of the area. In the other branches, dry forests are significantly less represented, ranging from 32% to 36%. The example of fairly poor and fairly rich forest site conditions clearly shows a trend towards a decrease in forest moisture content from west to east. While moist fairly poor and fairly rich forest site conditions predominate in the forests of the Western Polissia and Central Polissia forestry districts, fresh edaphic forests dominate in the Dnipro-Polissia and Eastern Polissia districts (Fig. 3).

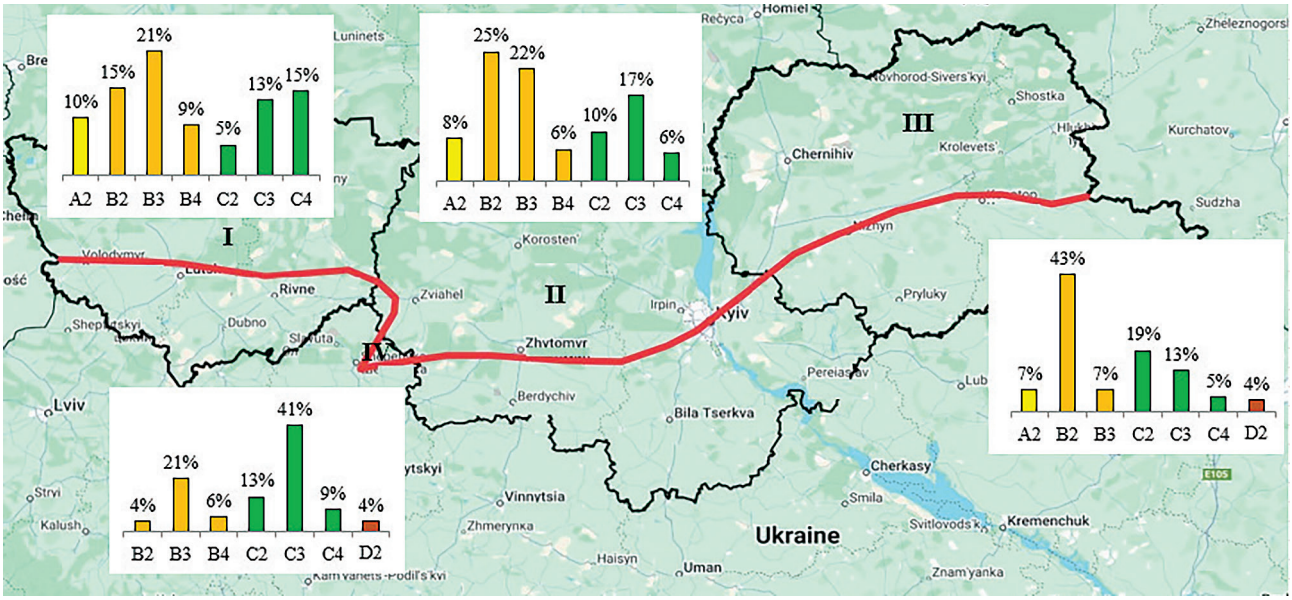

Figure 3. *Distribution of forest areas belonging to branches of the State Enterprise "Forests of Ukraine" located in the Ukrainian Polissia region, by predominant types of forest site conditions*
Note: *I – Branch "Poliskyi Forest Office", II – Branch "Stolychnyi Forest Office", III – Branch "Pivnichnyi Forest Office", IV – Branch "Podilskyi Forest Office"*
Source: *compiled by the authors*

Pine is the dominant tree species in 63% of forested areas. Plantations dominated by deciduous tree species, namely silver birch, common oak and black alder, are much less common (Fig. 4).

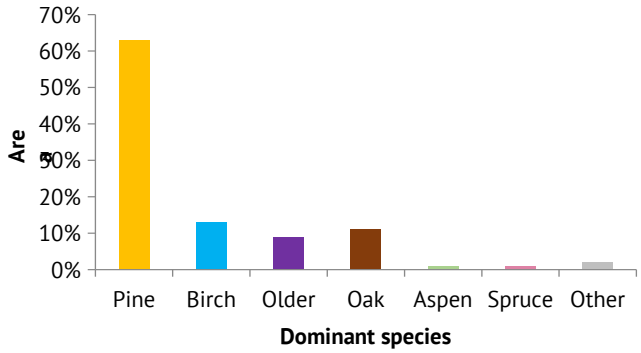

Figure 4. *Distribution of forest areas in the Ukrainian Polissia region by predominant species*
Source: *compiled by the authors*

The tree species composition of the forests of the Ukrainian Polissia varies across its branches, which is partly due to the differentiation of forest growing conditions. From west to east, the proportion of pine and oak stands increases, while the proportion of black alder decreases (Fig. 5).

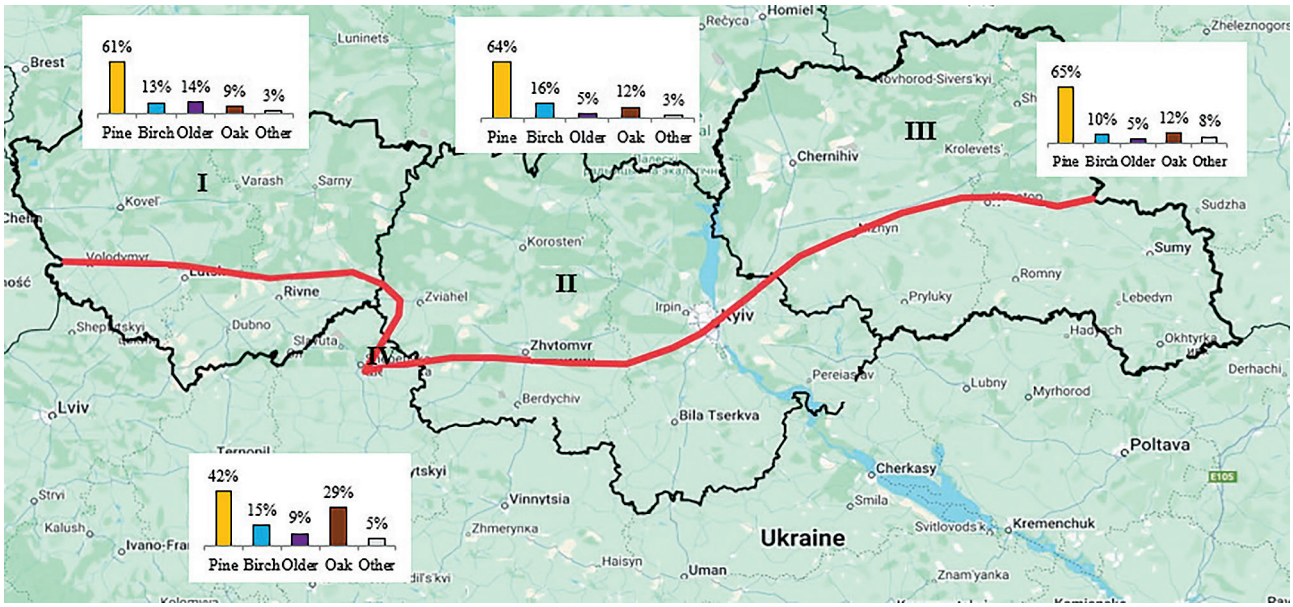

***Figure 5**. Distribution of forest areas belonging to branches of the State Enterprise "Forests of Ukraine" located in the Ukrainian Polissia region, by predominant tree species*
***Note:** I – Branch "Poliskyi Forest Office", II – Branch "Stolychnyi Forest Office", III – Branch "Pivnichnyi Forest Office", IV – Branch "Podilskyi Forest Office"*
***Source:** compiled by the authors*

The tree species composition of the forests belonging to the Branch "Podilskyi Forest Office", which are in the Polissia region, is representative of the Forestry Management Unit located on the border between Polissia and the forest-steppe zone of right-bank Ukraine. Notably, among the less common tree species in these forests, in addition to aspen and European spruce, there are common ash and common hornbeam. The species composition of the forests of the Northern Forest Branch has certain differences. In the forests of the Eastern Polissia Forestry District, which includes most of the forest plantations of this branch, there is a relatively higher proportion of other tree species, in particular willow, common ash, European spruce, and black locust. The age structure of forests in the Ukrainian Polissia is unbalanced, as evidenced by the ratio of forest areas of different age groups (Fig. 6). The proportion of young trees is 40% less than optimal, and the proportion of mature trees is 30% less than optimal. Considering the duration of the age group, the largest proportion is that of middle-aged forest stands, which is at least twice the optimal level. The proportion of maturing stands is also disproportionate to the age range of this age group and exceeds the optimal level by 30%.

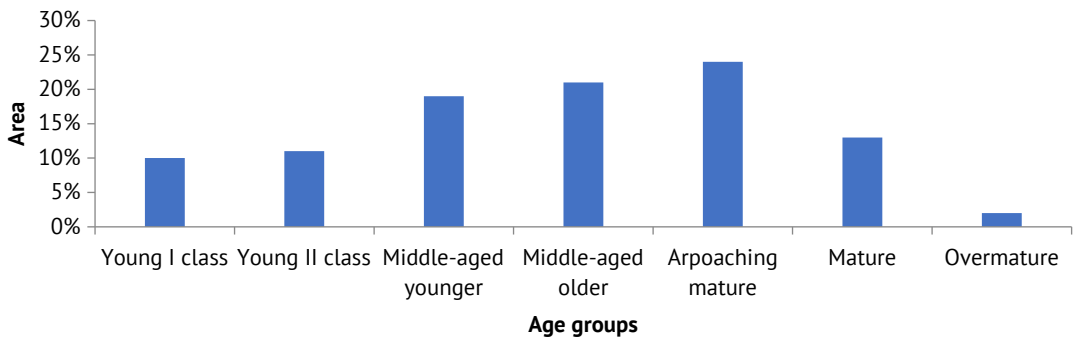

***Figure 6**. Distribution of forest areas in the Ukrainian Polissia by age group*
Source:compiled by the authors

In terms of the four branches of the State Enterprise "Forests of Ukraine", whose territories belong to the Ukrainian Polissia zone, the age structure of forest plantations has certain differences. The most noticeable trend is an increase in the proportion of mature and overmature plantations from west to east. Thus, while in the Branch "Poliskyi Forest Office" and Branch "Podilskyi Forest Office", the proportion of mature (including overmature) tree stands is 10% and 12% respectively, in the Branch "Stolychnyi Forest Office", mature forests cover 16% of the territory, and in the Branch "Pivnichnyi Forest Office", 21% (Fig. 7).

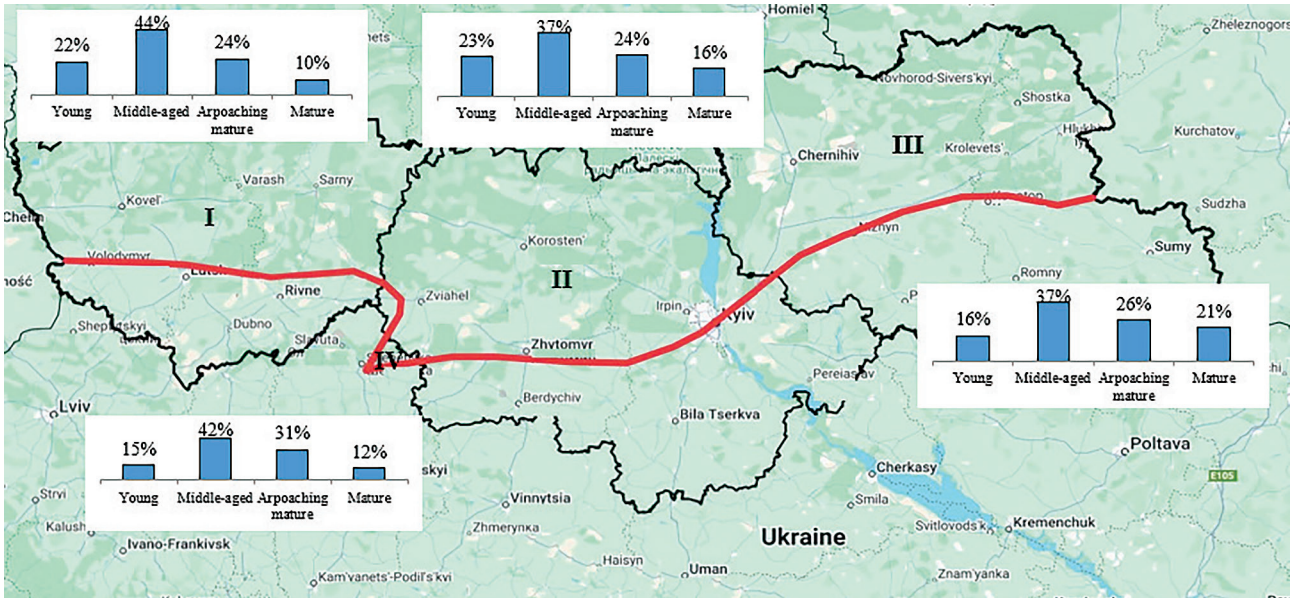

***Figure 7**. Distribution of forest areas of branches of the State Enterprise "Forests of Ukraine" located in the Ukrainian Polissia region, by age group*
***Note:** I – Branch "Poliskyi Forest Office", II – Branch "Stolychnyi Forest Office", III – Branch "Pivnichnyi Forest Office", IV – Branch "Podilskyi Forest Office"*
***Source:** compiled by the authors*

The productivity of the forests of Polissia in Ukraine is high, as indicated by the distribution of forest areas by forest site conditions classes. Plantations of forest site conditions classes I, II and Ia predominate in terms of area (Fig. 8). Highly productive forest plantations (forest site conditions classes I and above) account for almost 58% of the area, medium-productive plantations (forest site conditions classes II-IV) account for almost 41% of the area, and low-productive plantations (forest site conditions classes V and below) account for only slightly more than 1% (Fig. 8). The differentiation of forest site conditions in the forests of the Ukrainian Polissia region has led to a corresponding difference in the distribution of forest areas by forest site conditions classes across the branches of the State Enterprise "Forests of Ukraine". The highest productivity indicators are observed in the forests of the Branch "Pivnichnyi Forest Office", where tree stands of forest site conditions classes I and Ia predominate in terms of area (Fig. 9).

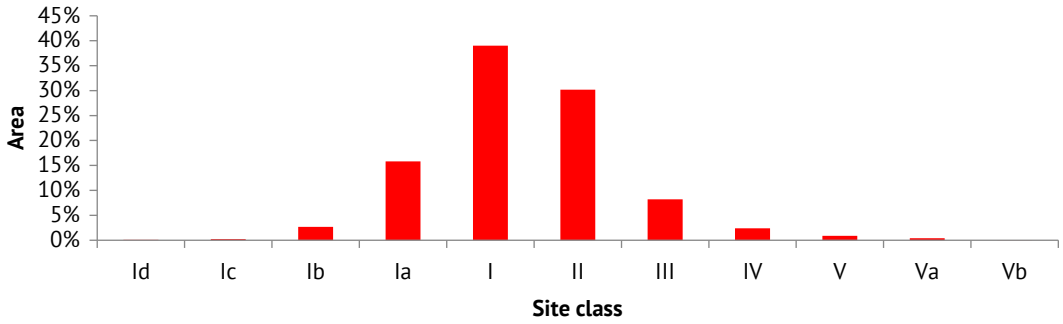

***Figure 8**. Distribution of forest areas in the Ukrainian Polissia by forest site conditions classes*
Source:compiled by the authors

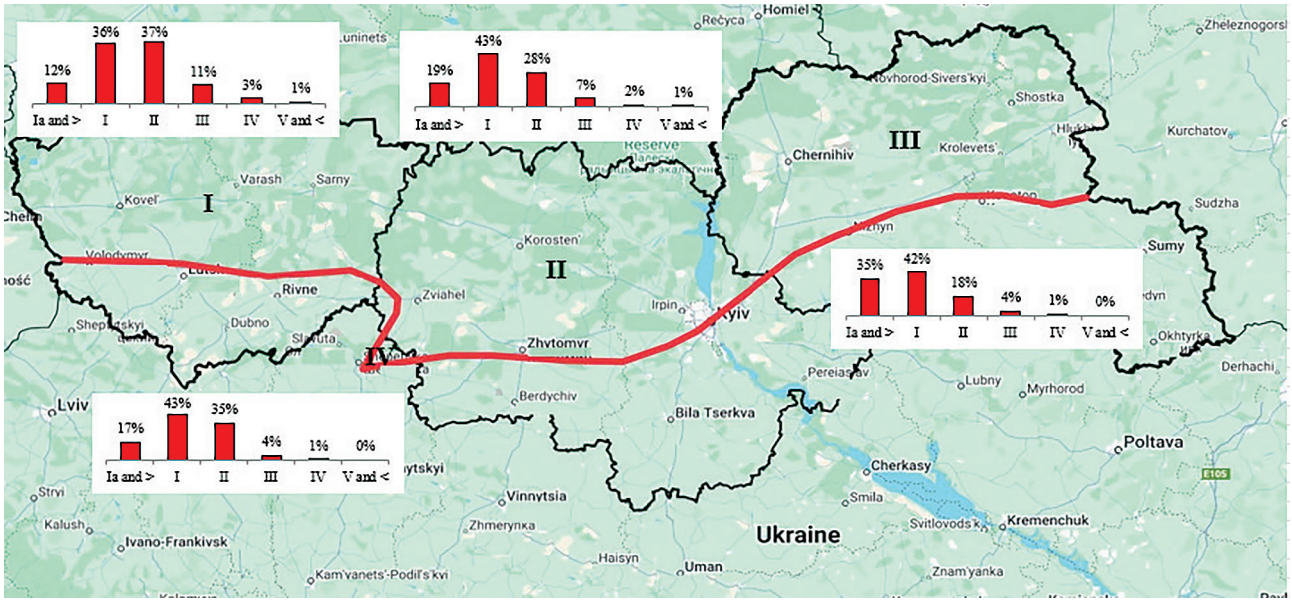

***Figure 9**. Distribution of forest areas belonging to branches of the State Enterprise "Forests of Ukraine" located in the Ukrainian Polissia region, by forest site conditions classes*
***Note:** I – Branch "Poliskyi Forest Office", II – Branch "Stolychnyi Forest Office", III – Branch "Pivnichnyi Forest Office", IV – Branch "Podilskyi Forest Office"*
***Source:** compiled by the authors*

The average forest site conditions class in the forests of this branch is Ia,9. The distribution of forest areas by forest site conditions classes in the forests of the Branch "Stolychnyi Forest Office" and Branch "Podilskyi Forest Office" is quite similar, with forest site conditions classes I and II predominating. The average forest site conditions class in both branches is I,3. Productivity indicators are relatively lower in the forests of the Western Polissia Forestry District, which are represented by the plantations of the Branch "Poliskyi Forest Office", where tree stands of productivity classes II and I prevail in terms of area. The average forest site conditions class is I.6. The results of research at the regional level create a comprehensive typologically oriented picture of the forests of the Ukrainian Polissia, covering the origin, structure of forest site conditions, tree species and age profiles, and productivity levels. Stable west-east gradients of edatope moisture and changes in species and age structure were identified, which compared and identified imbalances in age structure, incorporating the correspondence of the main tree species to the types of conditions.

DISCUSSION

The latest scientific works on the analysis of the forest fund of the Ukrainian Polissia are materials from 10-30 years ago. The most comprehensive and detailed regional description of forests was conducted by S. Hensiruk (1991), but these data were presented in terms of natural zones of Ukraine. The results of studies on changes in the composition of forests and forest growing conditions in the Ukrainian Polissia are, to some extent, consistent with the author's data, in particular, the increase in the proportion of artificial pine stands in the composition of forests from west to east, and the conclusions regarding the dependence of forest site conditions and continentality are also similar. A more detailed description of the forest fund is presented in the monograph by V. Tkachuk (2004), but in this scientific work, the analysis was conducted on Scots pine in the Right-Bank Polissia. The results of a comparative analysis of the forest fund of the Volyn, Rivne and Zhytomyr regions in terms of forest growing conditions, age structure and productivity generally correspond to our analytical data. The most valuable data are presented in the scientific article by M. Savushchyk and M. Popkov (2008), which concerns the typological structure of the forests of the Ukrainian Polissia. These materials most successfully and comprehensively describe the typological, age and species structure of the region's forests and, similar to present research, are based on forest management materials from the relational database of the Ukrderzhlesproekt State Enterprise. The data on the typological structure of state-owned forests as of 2008 differ from our data in that they show a higher proportion of poor and fairly poor forest site conditions and a lower proportion of fairly rich and rich forest site conditions. This is due to changes in the structure of forests during the 2022-2025 reorganisation, as all of the above-mentioned authors used materials on forest users in the structure of the State Committee of Forestry of Ukraine, while

the present data was obtained by processing forest management data on the structural units of the State Enterprise "Forests of Ukraine" as of 2025.

The increase in the proportion of fairly rich forest site conditions (~34%) in the eastern direction and the minimal representation of rich forest site conditions (~3%) reflect the natural decrease in edatope humidity from west to east. A similar west-east gradient of hydrothermal conditions and corresponding spatial differentiation of forest site conditions for Polissia and Ukraine as a whole was noted by V. Tkach (2024). The shift to "drier" edatopes in the east is accompanied by more frequent use of controlled regeneration regimes – from assisted natural regeneration to the creation of cultures – as interpreted by regional reviews (Zhezhkun *et al*., 2023; Skliar *et al*., 2024). V. Ovcharuk *et al*. (2020) showed an increase in evaporation by 110-185 mm and a drop in the humidity index to ≈101%, which explains why the need for artificial forest restoration is increasing in the east. In addition, Y. Nykytiuk *et al*. (2022) noted a degumification and a decrease in the buffer capacity of sod-podzolic soils – another argument in favour of artificial reforestation strategies in the fairly rich forest site conditions.

The observer 63% of the area under Scots pine and the simultaneous decrease in the proportion of alder from the east are consistent with studies on continentality as a driver of change in the composition of tree stands in Europe (Koch *et al*., 2022). The increased sensitivity of continental subzones to spring frosts and summer droughts, as shown by L. Chen *et al*. (2023) selectively support more xerophytic taxa (*Pinus*, *Quercus*) and displace the moisture-loving *Alnus* to the "wetter niches" of the terrain. In a study of forests in Central and Eastern Europe, M. Niemczyk *et al*. (2021), using Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco) (not native to Polissia, but a representative model) as an example, demonstrated an increase in relative productivity in more continental conditions, supporting the idea of mixed compositions and the selection of resistant species in eastern subzones. The observation of increased participation of hornbeam, ash, black locust, and willow is a sign of an "adaptive mosaic" of compositions to mitigate the risks of moisture deficiency and temperature extremes, which is consistent with the data of R. Seidl *et al*. (2017) and R. Sousa-Silva *et al*. (2018).

The imbalance in age structure identified by the authors typically arises due to "wave-like" histories of felling/restoration and cautious logging regimes in more continental regions. The results of studies by T. Wang *et al*. (2024) confirm the conclusions that the increase in the proportion of mature and overmature stands from west to east (≈10-21% depending on the branch) correlates with a higher frequency of droughts and heat extremes, which make it difficult to convert areas to younger classes. A. Di Sacco *et al*. (2021) showed that more continental regions are losing productivity due to droughts and are experiencing "stretched" transitions between age classes, while more humid regions have a more balanced age structure. The proportion of highly productive stands (~58% I–Ia) directly reflects the correspondence of the composition and age structure to forest growing conditions: in fresh/moist fairly poor forest site conditions, the potential is realised most fully; in fairly rich forest site conditions, productivity is more strongly modulated by water deficit and heat extremes. S. Song *et al*. (2024) showed that targeted artificial reforestation programmes, if they incorporate moisture deficit, species selection and water regime management, can stabilise growth in drier analogues of mixed forest conditions.

European reviews by M. Erdozain *et al*. (2023) and D. Thom and R. Seidl (2022) systematically justify the expansion of tools from assisted natural regeneration to mixed crops with stable genotypes in conditions of drought, pests and windbreaks. According to N. Mansuy *et al*. (2020), reforestation policy in North America is also biased towards the scaling of artificial regeneration. A. Di Sacco *et al*. (2021) noted an increase in artificial forests as a response to climate change, while J. Fargione *et al*. (2021) outlined the key challenges and prospects of this course. For the Polissia region of Ukraine, this means that in the "wetter" north-western of the fairly poor forest site conditions zones, natural regeneration should be prioritised, and in the "drier" eastern types of forest site conditions, artificial forest restoration with a mixed composition involving drought- and frost-resistant species. Thus, the geospatial dependence of the typological structure of forests and the trend of "drying" of edatopes to the east are fully consistent with long-term regional observations by domestic and foreign scientists, as well as modern hydroclimatic assessments. The leading role of pine (63%) and the eastern growth of pine and oak, with a simultaneous decline in alder, reflect the known patterns of continentality.

CONCLUSIONS

Natural tree stands occupy a slight majority in the structure of the region's forests (52%), but their share varies significantly between individual branches of the State Enterprise "Forests of Ukraine". In particular, the largest share of natural forests is characteristic of the Branch "Poliskyi Forest Office" (60%), and the smallest share is characteristic of the Branch "Pivnichnyi Forest Office" (34%). An analysis of trophic habitats showed the dominance of fairly poor forest site conditions (over 50% of the area), of which fresh and wet types are the most common. The share of fairly rich forest site conditions is about 34%, while forest conditions are the least common, at 3%. The spatial distribution of these types of conditions shows a regular decrease in the humidity of edaphic conditions from west to east of the region.

The leading tree species is Scots pine, which accounts for 63% of forests. The proportion of deciduous species (silver birch, common oak, black alder) is significantly lower. There are regional differences in species composition: from west to east, the proportion of pine and oak increases, while the proportion of alder decreases. In the transitional zones of Polissia and Lisostep, there is also an increased proportion of hornbeam, ash, black locust and willow. The age structure of forests is unbalanced: the low proportion of young and mature stands is accompanied by an excess of middle-aged and maturing stands. The proportion of mature and overmature forests increases from west to east and ranges from 10% to 21% depending on the branch. The productivity of the forests of Polissia in Ukraine remains generally high: the proportion of highly productive stands (forest site conditions classes I and Ia) is almost 58%. The highest forest site conditions classes were recorded in the Branch "Pivnichnyi Forest Office" (average class Ia,9), and the lowest in the Branch "Poliskyi Forest Office" (I,6). The results of the study confirm the close relationship between the productivity of plantations and forest site conditions and can be used as a basis for studying the natural productivity of native and secondary plantations in the Ukrainian Polissia.

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Анотація. У статті досліджено просторову та лісівничу структуру лісового фонду Українського Полісся на основі матеріалів лісовпорядкування чотирьох Філій Державного спеціалізованого підприємства «Ліси України»: Поліського, Північного, Столичного та Подільського лісових офісів. Методика включала кілька етапів: просторовий аналіз з використанням ГІС-інструментів та лісовпорядних матеріалів для визначення адміністративних одиниць у межах природної зони Полісся; формування бази даних за основними таксаційними показниками (породний склад, типи лісорослинних умов, походження, вікові групи, бонітет); аналітичне узагальнення структури лісів за адміністративними одиницями. Встановлено, що переважають природні ліси (52 % площі), однак їх частка варіює за регіонами. Панівною породою є сосна звичайна, яка займає близько 63 % загальної площі. Виявлено високу мозаїчність типів лісорослинних умов із домінуванням суборів і сугрудів. У структурі переважають високобонітетні насадження (I клас і вище – 58 % площі). Виявлено певні закономірності у лісотаксаційній структурі лісів, які пов'язані зі збільшенням континентальності клімату із заходу на схід, а саме: збільшення частки штучних насаджень, зміна переважаючих вологих і сирих гігротопів на свіжі, зменшенням участі м'яколистяних порід у складі, зростання продуктивності лісів, збільшення частки пристигаючих і стиглих деревостанів. Результати дослідження можуть бути використані для оптимізації управління лісовими ресурсами, розроблення регіональних стратегій сталого лісокористування та збереження екосистемної стійкості лісів Полісся

Ключові слова: походження лісів; типи лісорослинних умов; продуктивність лісів; просторовий аналіз; ГІС