Received: 08/21/2021, Revised: 10/20/2021, Accepted:11/24/2021

UKRAINIAN JOURNAL OF FOREST AND WOOD SCIENCE

UKRAINIAN JOURNAL OF FOREST AND WOOD SCIENCE

Journal homepage: https://forestscience.com.ua/en
Ukrainian Journal of Forest and Wood Science, 12(4), 17-25

UDC 630*114.351
DOI: https://doi.org/10.31548/forest2021.04.002

Structural features of the forest litter of water protection pine stands in wet hygrotopes of Zhytomyr Polissya

Andrii Rasenchuk*, Vasyl Yukhnovskyi

National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine

Abstract. The results of a study of the fractional composition, structure, and development of forest litter in water protection pine stands that grow in the prevailing wet subor and sudubrava forest conditions of Zhytomyr Polissya are presented. The age range of plantings ranges from 18-85 years. It is established that water protection pine stands in wet hygrotopes accumulate significant reserves of forest litter, which range from 33.0 t/ha in young stands to 77.0 t/ha in mature plantings. The distribution of forest litter by area in most plantings is uniform, although, in young stands, a large proportion of it accumulates in the row spacing. In terms of composition, the forest litter of pure pine stands is characterised by an average dense structure, and in pine forests with an admixture of deciduous species, the litter is usually loose, which is conditioned by the presence of annual fallen leaves in its upper horizon. The thickness of the forest litter in the row spacing of young stands varies between 2.6-2.9 cm without its clear distribution on the horizons. In middle-aged plantings, horizons are clearly distinguished in the litter profile. The total thickness of the litter reaches 4.0-4.3 cm. In ripening and ripe pine stands, the thickness of the forest litter ranges from 6.0-6.3 cm. In plantings of older age groups, the forest litter has a predominantly three-layered structure. The trend of intensive accumulation of forest litter in wet subor and sudubrava conditions up to the age of ripeness is revealed. In ripening plantings, the accumulation of litter slows down, in mature plantings, the processes of accumulation and decomposition of litter are levelled. The tendency of the predominance of the active part and, accordingly, a decrease in the inactive litter fraction in ripening and mature plantings of wet sudubrava in comparison with subor conditions is established, which indicates more active processes of litter mineralisation in wet sudubrava conditions

Keywords: stand composition, age group, forest conditions, precipitation, active and inactive litter fractions, capacity, mineralisation

Suggested Citation:

Rasenchuk, A., & Yukhnovskyi, V. (2021). Structural features of the forest litter of water protection pine stands in wet hygrotopes of Zhytomyr Polissya. *Ukrainian Journal of Forest and Wood Science*, 12(4), 17-25.

*Corresponding author

Introduction

Forest litter performs a multifaceted ecological and reclamation role in forest ecosystems. It prevents the development of erosion processes due to the accumulation of precipitation and their transformation into the ground water, reducing the physical evaporation of moisture from the soil and freezing it in winter, contributes to the accumulation of meltwater and precipitation and their transfer to ground water. Throughout the growing season, the litter serves as a kind of storage of nutrients that eventually pass into the soil, which allows maintaining a certain level of its fertility. In addition to enriching the soil with nutrients, the litter acts as mulch (Svyrydenko *et al.*, 2004).

The water protection function of floodplain forest litter is manifested in preventing siltation of water bodies, purifying water from pollutants, regulating water levels, and stabilising the hydrological regime of territories. The forest litter is also a food base and habitat for soil invertebrates and microorganisms and, as a result, improves the forest floor fertility.

Tsvetkova & Yakuba (2011) highlight the role of forest litter as a biogeochemical barrier that traps toxic metals and plays a leading role in the ability of ecosystems to self-regulate.

The forest litter performs a significant anti-erosion role, it absorbs 2-6 times more water than its mass; it perceives the kinetic energy of rain and protects the soil from destruction; the rough surface of the litter slows down the rate of runoff and facilitates soil sedimentation. With the removal of litter, runoff increases and soil water permeability decreases by 5-10 times (Gomyyo & Kuraji, 2016).

Depending on the species composition of stands, different types of forest litter are formed, which differ in the intensity and rate of mineralisation (Bogatyrev, 1990). Intensification of the processes of mineralisation of forest litter contributes to increasing the productivity of forest ecosystems, since under such conditions mineral compounds of nitrogen, phosphorus, potassium, and other elements that make up the food ration of plants are formed.

Litter plays an important role not only in the processes of substance circulation in ecosystems, but also in the processes of soil formation and reflects the zonal features of the geographical location of plantings. Especially multifaceted is the forest reclamation role of the forest litter, which determines water-regulating, water-retaining, water treatment, soil protection, anti-erosion, and other functions (Yukhnovsky *et al.*, 2013).

Fallen leaves, twigs, bark, cones, seeds, and other organic remains of forest vegetation are considered litter. The amount of litter depends on the species composition of plants, age, and form of planting (Yakuba, 2004; Solomatova, 2013).

The researchers also point to the layered structure of the forest litter. In particular, Vyshenska *et al.* (2010) distinguish the top layer of litter, which consists of fresh litter that has not yet decomposed with clearly defined elements – leaves, bark, small branches, fruits, etc. Below it is a layer that includes litter components that are already significantly damaged by the decomposition process, but their small particles still retain their morphological structure. The lower layer of litter is actually detritus, which looks like a more or less uniform organic mass of dark colour.

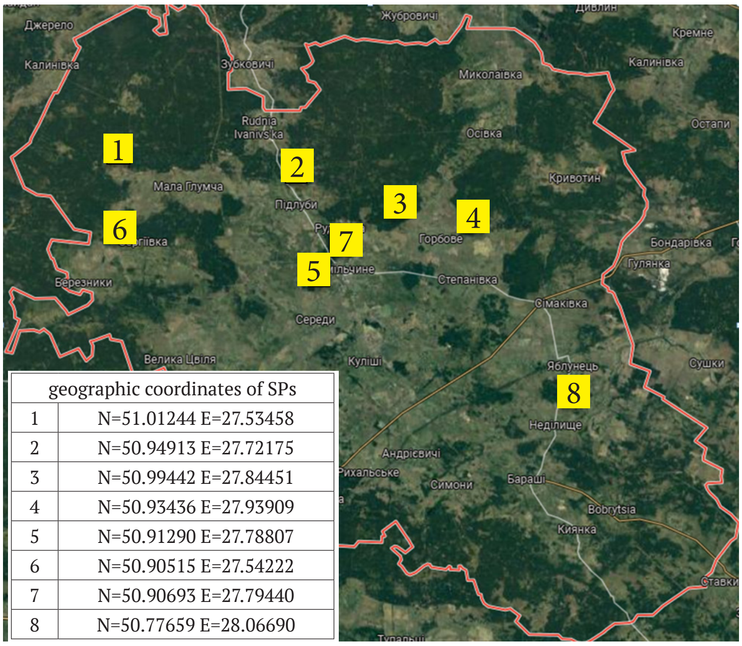
The fractional composition of the forest litter of pine stands was studied by Krylov (2013), Avramchuk & Bilous (2015), Kalynovsky (2017), Kamsky & Shelest (2017), Xu *et al.* (2020), Golovetskyi *et al.* (2021), Maliuha *et al.* (2021), Novák *et al.* (2020), Minder *et al.* (2019) etc. Litter in pine stands decomposes slowly, and the rate of its mineralisation decreases with age, as also shown by studies by Corter (1998), Voron *et al.* (2018), Çömez *et al.* (2020) *et al.* The reclamation and anti-erosion properties of the forest litter of pine stands on ravine-beam systems are highlighted in the monograph by Yukhnovsky *et al.* (2013). However, the issue of the structure of the forest litter of water protection stands with the main species of Scots pine, the dominant share of which grows in the wet hygrotopes of Zhytomyr Polissya, is unresolved.

The purpose of the study was to establish the structure, fractional composition, and formation of the forest litter of water protection pine stands growing in wet subor and sudubrava forest conditions of Zhytomyr Polissya.

Materials and Methods

The object of the study was clean and mixed artificial stands of Scots pine, which perform water protection functions. To establish the patterns of forest litter formation in wet subor and sudubrava conditions, eight sample plots (SP) were laid in different age groups with predominant Scots pine stands (*Pinus sylvestris* L.), and including admixtures of European white birch (*Betula pendula* Roth.), common oak (*Quercus robur* L.), black alder (*Álnus glutinósa* L.) and small-leaved linden (*Tilia cordata* Mill.).

Sample plots were laid out in the flat conditions of Zhytomyr Polissya within the Yemilchynskyi district in the forest fund of the state enterprise "Yemilchynskyi Forestry" (Fig. 1). In general, the research objects cover seven forest districts of the enterprise.



geographic coordinates of SPs	
1	N=51.01244 E=27.53458
2	N=50.94913 E=27.72175
3	N=50.99442 E=27.84451
4	N=50.93436 E=27.93909
5	N=50.91290 E=27.78807
6	N=50.90515 E=27.54222
7	N=50.90693 E=27.79440
8	N=50.77659 E=28.06690

Figure 1. Location of the research objects

The establishment of sample plots was carried out in the most characteristic place of each planting according to the recommendations of Maurer *et al.* (2000). Forestry and taxation indicators of the stands were determined at the sample plots according to the methods generally accepted in forest taxation (Hrom, 2007). The characteristics of water protection plantings according to the sample plots are given in Table 1.

Table 1. Forestry and taxation indicators of sample plots by age groups

No.	Location	Stand composition	Age, years	Forest site type	Density	Growth class	Average height, m	Average diameter, cm	Reserve, m³/ha
Young stands (I)									
1	Kochychynske forestry compartment No. 36 stratum 4	8Sp2Ewb	18	C_3	0.72	I	8.1	12.2	65
2	Zhuzhelske forestry compartment No. 46 stratum 24	10Sp+Ewb	18	B_3	0.74	I	7.0	8.4	45
Middle-aged (II)									
3	Hartivske forestry compartment No. 77 stratum 20	6Sp3Ewb1Co	28	B_3	0.70	II	10.5	12.0	85

Table 1, Continued

No.	Location	Stand composition	Age, years	Forest site type	Density	Growth class	Average height, m	Average diameter, cm	Reserve, m^3/ha
4	Korolivske forestry compartment No. 33 stratum 17	5Sp4Ewb1Ba	22	C_3	0.71	II	8.2	10.3	70
Ripening (III)									
5	Yemilchynske forestry compartment No. 60 stratum 34	10Sp	66	B_3	0.79	I^a	25.0	32.1	568
6	Hlumchanske forestry compartment No. 66 stratum 29	8Sp1Ewb1Ba	69	C_3	0.81	I^a	27.3	30.2	350
Mature and overripe (IV)									
7	Yemilchynske forestry compartment No. 69 stratum 2	9Sp1Ewb	85	B_3	0.71	I	27.0	31.5	290
8	Barashivske forestry compartment No. 8 stratum 44	9Sp1Sll+Co	85	C_3	0.77	I^a	30.4	36.2	424

The age range of the stands is 18-85 years. In wet subor plantings, average heights range from 7.0-27.0 m, with an average diameter of 8.4 to 31.5 cm, and reserve – 45 to 568 m^3/ha. In wet sudubrava plantings, the average height ranges between 8.1-30.4 m, the average diameter – 10.3-36.2 cm, and reserve – 65-424 m^3/ha. Water protection plantings in all forest-growing conditions are growing for I^a– II growth class. All sample plots belong to the modal stands most represented in the region with a thickness of 0.70-0.81.

The study of forest litter was carried out on discount areas, which were laid in the plantings of the studied age groups on sample plots. Discount areas were placed in the middle of the row spacing. The discount area was selected depending on the age group of plantings and the thickness of the forest litter. It was usually 1 m^2 (1.0×1.0 m) or 0.5 m^2 (0.5×1 m). The thickness of the forest litter was measured with a tape measure from the soil surface. On the discount area, the litter was cut off with a knife, carefully separating each layer, poured into numbered containers, and was disassembled into fractions in laboratory conditions (Fig. 2).

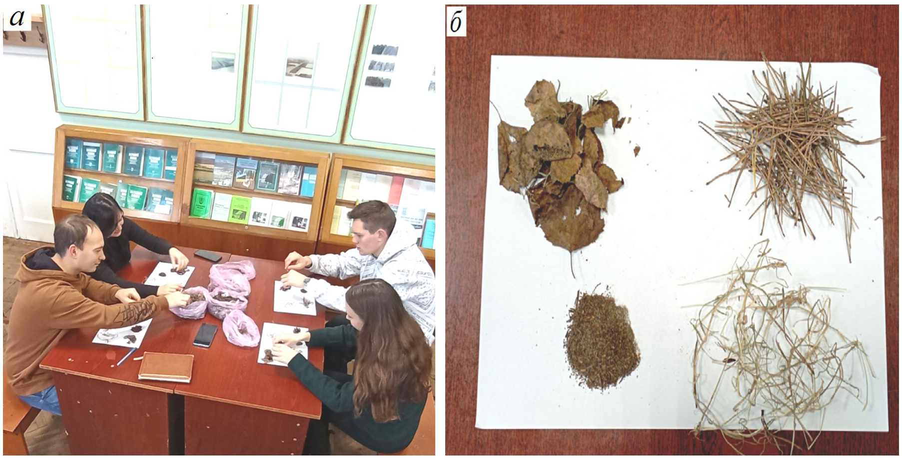


Figure 2. Distribution of forest litter samples into fractions: *a* – the process of dividing into fractions; *b* – selected factions

Each fraction was then weighed on an electronic scale with an accuracy of 0.01 g, and to calculate the forest litter reserve, the data obtained were recalculated per 1 ha (Hordienko *et al.*, 2000).

Results and Discussion

The thickness of the litter, the rate of its decomposition and release of chemical elements depend on the type of forest, its age, stand thickness, climatic and soil conditions, the characteristics of the edaphotope (soil conditions, water and heat regime, etc.), participation in the composition of the stand, except for coniferous, deciduous tree species, the presence or absence of grass or moss cover. Therefore, the characteristic of morphometric indicators of the forest litter of water protection plantings, which is reflected in Table 2, were analysed with the above-mentioned forest indicators – the composition of plantings and age groups.

Table 2. Characteristics of the forest litter of water protection pine stands

No.	Age group	Stand composition	Age	Forest litter indicators					
				width, cm	total reserve, t/ha	Reserve by fractions			
						active		inactive	
						t/ha	%	t/ha	%
Wet subor stands (B_3)									
1	I	10Sp+Ewb	18	2.9	33.0	20.8	63	12.2	37
3	II	6Sp3Ewb1Co	28	4.3	42.2	22.8	54	19.4	46
5	III	10Sp	66	6.0	64.8	41.5	64	23.3	36
7	IV	9Sp1Ewb	85	6.0	77.0	55.4	72	21.6	28
Wet sudubrava stands (C_3)									
2	I	8Sp2Ewb	18	2.6	21.3	13.0	61	8.3	39
4	II	5Sp4Ewb1Ba	22	4.0	31.7	20.0	63	11.7	37
6	III	8Sp1Ewb1Ba	69	6.1	60.0	41.4	69	18.6	31
8	IV	9Sp1Sll+Co	85	6.3	82.5	60.2	73	22.3	27

Data in Table 2 indicate an intensive accumulation of forest litter in wet subor and sudubrava conditions up to the age of ripeness, where its thickness reaches 6 cm. In ripening plantings, the accumulation of litter slows down, and in mature and overripe stands it remains at the same level, that is, the processes of accumulation and decomposition of litter are equalised. This is consistent with studies by Voron *et al*. (2018), Golovetskyi *et al*. (2021).

The thickness of the forest litter in the row spacing of young stands varies between 2.6-2.9 cm. A clear distribution of litter on the horizons is not yet observed, although the half-mineralised lower layer can be traced up to 1.3 cm, and the upper layer, which consists of precipitation of the first or second years, has a thickness of 1.6-1.8 cm. Its composition is dominated by Scots pine needles with an admixture of European white birch leaves and branches.

In middle-aged water protection plantings, the profiles already clearly distinguish the litter horizons. The total litter capacity is 4.0-4.3 cm. The lower layer is represented by a semi-decomposed organic mass up to 1.7 cm thick, and the middle layer is represented by semi-mineralised remains of pine needles, leaves, and small roots. The thickness of this horizon is 1.5-2.3 cm, and the upper layer is 1.0-1.5 cm.

In ripening and ripe pine stands, the thickness of the forest litter varies between 6.0-6.3 cm, respectively. The lower layer of litter, 1.4-2.2 cm thick, is almost completely decomposed. The middle layer of litter is represented by ungainly twigs, bark, and needles. Its width is 2.0-2.4 cm. Fresh annual precipitation from twigs, needles, and pine cones covers the surface of the forest floor with a layer of 2 cm.

The distribution of forest litter by area in most plantings is uniform, only in young stands, there is more of its accumulation in the row spacing. By composition, the forest litter of pure pine forests is characterised by an average dense structure. In pine stands with an admixture of deciduous species, the litter is usually loose, which is conditioned by the presence of annual fallen leaves in its upper layer. The ratio of active and inactive litter fractions depending on the composition of the plantation is shown in Figure 3.

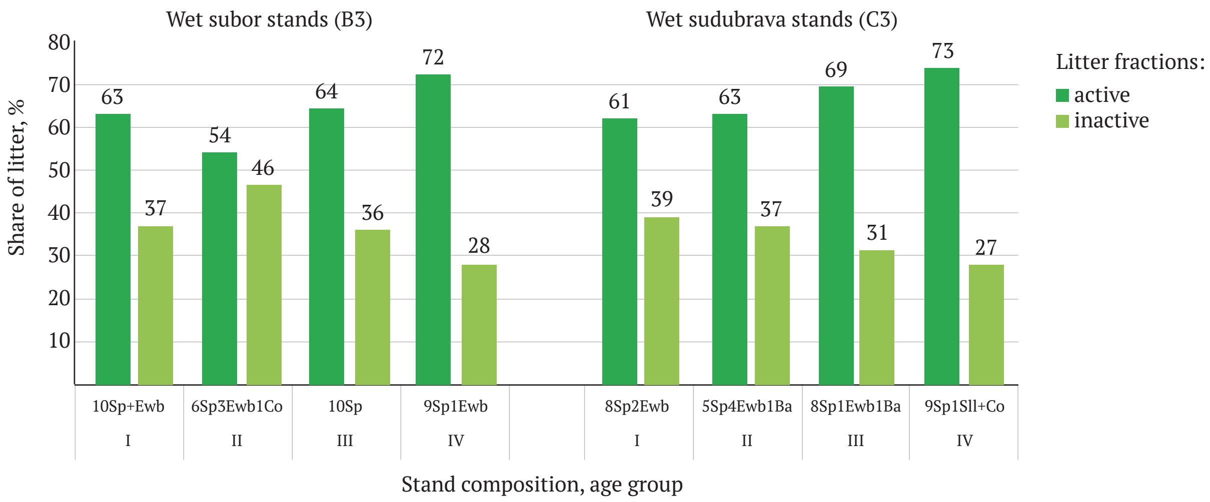


Figure 3. The ratio of active and inactive litter fractions depending on the age group and stand composition

Data analysis of Figure 3 revealed a tendency for the active part to predominate and, accordingly, a decrease in the inactive litter fraction in ripening and mature wet sudubrava stands compared to subor conditions. This indicates more active processes of litter mineralisation in wet sudubrava conditions, which is primarily associated with higher soil trophism. In general, the active part of the fractional composition of the litter is 54-73%, and the inactive part amounts to 27-46%.

The total reserve of forest litter ranges from 33.0 t/ha in young stands to 77.0 t/ha in mature plantings, which indicates an increase in forest litter with age. Detailed summary data of reserves by litter fractions are given in Table 3.

Table 3. Generalised stock data by litter fractions

Age groups and composition, age, and SP No.	Layer of litter	Reserve of litter, t/ha	Litter fractions, t/ha				
			Inactive part			Active part	
			branches	bark	cones, needles	leaves, grass, buds	roots, dust, entomofauna
		Wet subor stands (B_3)					
Young stands: 10Sp+Ewb; A – 18; SP No. 1	**1st**	8.2	0.6	0.8	5.0	0.1	1.7
	2nd	24.7	0.6	0.7	4.4	0.1	19.0
	Σ	**33.0**	**1.2**	**1.5**	**9.4**	**0.2**	**20.7**
Middle-aged stands: 6Sp3Ewb1Co; A – 28; SP No. 3	**1st**	12.0	0.6	0.6	7.6	1.5	1.6
	2nd	30.2	2.8	1.4	6.4	0.9	18.8
	Σ	**42.2**	**3.4**	**2.0**	**14.0**	**2.4**	**20.4**
Ripening stands: 10Sp; A – 66; SP No. 5	**1st**	11.2	3.5	1.1	4.2	0.8	1.5
	2nd	16.8	3.0	2.3	3.7	0.5	7.4
	3rd	36.8	2.0	1.9	1.9	-	31.0
	Σ	**64.8**	**8.5**	**5.3**	**9.8**	**1.3**	**39.9**
Mature stands: 9Sp1Ewb; A – 85; SP No. 7	**1st**	12.3	3.5	1.3	5.0	0.5	2.0
	2nd	18.6	1.8	2.4	3.8	0.6	10.1
	3rd	46.1	1.2	0.9	2.1	-	41.8
	Σ	**77.0**	**6.5**	**4.6**	**10.9**	**1.1**	**53.9**

Age groups and composition, age, and SP No.	Layer of litter	Reserve of litter, t/ha	Litter fractions, t/ha				
			Inactive part			Active part	
			branches	bark	cones, needles	leaves, grass, buds	roots, dust, entomofauna
		Wet sudubrava stands (C_3)					
Young stands: 8Sp2Web; A – 18; SP No. 2	**1st**	8.5	1.2	0.9	2.4	0.9	3.1
	2nd	12.9	0.5	1.1	2.3	0.5	8.4
	Σ	**21.3**	**1.7**	**2.0**	**4.7**	**1.4**	**11.5**
Middle-aged stands: 5Sp4Ewb1Ba A – 22; SP No. 4	**1st**	10.9	2.2	1.0	3.2	1.8	2.6
	2nd	20.8	1.6	1.4	2.2	2.6	13.0
	Σ	**31.7**	**3.8**	**2.4**	**5.4**	**4.4**	**15.6**
Ripening stands: 8Sp1Ewb1Ba; A – 69; SP No. 6	**1st**	12.2	2.7	2.3	3.1	2.2	2.0
	2nd	15.1	2.0	1.6	2.7	1.0	7.6
	3rd	32.7	1.3	1.1	1.8	0.2	28.4
	Σ	**60.0**	**6.0**	**5.0**	**7.6**	**3.4**	**38.0**
Mature stands: 9Sp1Ba+Co; A – 85; SP No. 8	**1st**	16.6	3.0	2.1	4.8	2.5	4.2
	2nd	23.8	2.2	1.6	3.8	1.6	14.6
	3rd	42.1	1.4	1.5	1.9	0.6	36.6
	Σ	**82.5**	**6.6**	**5.2**	**10.6**	**4.7**	**55.5**

Table 3 indicates that in young and middle-aged plantings of wet subor and sudubrava, the litter has a two-layered structure. The first layer is dominated by an inactive part of branches, bark, cones, and needles, the share of which in the conditions of wet subor and sudubrava of the first age group is 6.4 t/ha (78.0%) and 4.5 t/ha (53.0%), in the middle-aged, respectively, 8.8 t/ha (73.3%) and 6.4 t/ha (58.7%). The second layer of litter of age groups 1 and 2 is already dominated by the active part with a large amount of dust, which is 3-4 times higher than the inactive part of the forest litter.

With age, the litter acquires a three-layer structure. This phenomenon is obvious in connection with the accumulation of litter and its distribution to the horizons. There is a clear trend of increasing the active litter fraction in ripening and ripe wet sudubrava plantings, which indicates more active processes of its mineralisation in contrast to the water protection pine stands of wet subor.

Conclusions

Water protection pine stands in wet subor and sudubrava conditions accumulate significant reserves of forest litter, which range from 33.0 t/ha in young stands to 77.0 t/ha in mature plantings.

The distribution of forest litter by area in most plantings is uniform, only in young stands, there is more of its accumulation in the row spacing. In terms of composition, the forest litter of pure pine stands is characterised by an average dense structure, and in pine forests with an admixture of deciduous species, the litter is usually loose, which is conditioned by the presence of annual fallen leaves in its upper horizon.

The thickness of the forest litter in the row spacing of young stands varies between 2.6-2.9 cm without its clear distribution on the horizons. In plantings of older age groups, there is a clear distribution of forest litter on the horizons. The forest litter has a predominantly three-layer structure. The top layer of litter consists of still undeveloped fresh litter of needles, leaves, bark, small branches, and fruits. A wide second semi-decomposed layer of litter is saturated with pine roots, needles, and entomofauna remains, but small particles of them still retain their morphological structure. The lower layer of litter is actually detritus, which looks like a more or less uniform organic mass of dark colour.

The trend of intensive accumulation of forest litter in wet subor and sudubrava conditions up to the age of ripeness, where its thickness reaches 6 cm of thickness, was revealed. In ripening stands, the accumulation of litter slows down, but in mature stands it remains at the same level, that is, the processes of accumulation and decomposition of litter are levelled.

The tendency of the predominance of the active part and, accordingly, a decrease in the inactive litter fraction in ripening and mature plantings of wet sudubrava in comparison with subor conditions is established, which indicates more active processes of litter mineralisation in wet sudubrava conditions.

References

[1] Avramchuk, O. O., & Bilous, A. M. (2015). The Estimation of Litter Mortmass of Pine Forests in Kiev Polissya. *Scientific Bulletin of UNFU*, *25.3*, 50–55 [in Ukrainian].

[2] Bogatyrev, L. (1990). About classification of forest litters. *Soil science*, *3*, 118–127 [in Russian].

[3] Corter, J. (1998). Field decomposition of leaf litters: relation-ships between decomposition rates and soil moisture, soil temperature and earthworm activity. *Soil Biol. Biochem*, *30* (6), 783–793.

[4] Çömez, A., Güner, S., & Tolunay, D. (2020). The effect of structural and environmental changes on litter decomposition of in Pinus sylvestris stands. *Research Square*, 1–19. https://doi.org/10.21203/rs.3.rs-50741/v1

[5] Golovetskyi, M., Urliuk, Y., & Yukhnovskyi, V. (2021). *Water protection pine plantations of the Ukrainian interfluve of the Dnieper and Desna rivers*. Kyiv: Condor Publishing House.

[6] Gomyyo, M., & Kuraji, K. (2016). Effect of the litter layer on runoff and evapotranspiration using the paired watershed methodhttps. *Journal of Forest Research*, *21*(6), 306–313. https://doi.org/10.1007/s10310-016-0542-5

[7] Hordienko, M., Maurer, V., & Kovalevskyi, S. (2000). *Method instructions of study and research of forest plantations*. Kyiv: National Agricultural University [in Ukrainian].

[8] Hrom, M. M. (2007). *Forest assessment*. Lviv: UNFU [in Ukrainian].

[9] Kamsky, T., & Shelest, Z. (2014.) *Methodical aspects of determination of forest stock and poer bedding*. Zhytomyr: Zhytomyr State Technological University [in Ukrainian].

[10] Kalynovskyi, N. V. (2017). *Bioindication of Ecological Condition of Pine Forest Stands in Zhytomyr Polissya*. Zhytomyr: Zhytomyr National Agroecological University.

[11] Krylov, Ya. (2013). Meliorative characteristics of forest litter of oak erosion stands. *Scientific Bulletin of UNFU*, *23* (17), 43–48 [in Ukrainian].

[12] Maliuha, V., Khryk, V., Minder, V., Kimeichuk, I., Raduchych, M., Rasenchuk, A., Brovko, F., & Yukhnovskyi, V. (2021). Fractional composition and formation of forest litter in scots pine plantations on ravine-gully systems and the plain of the Central part of Ukraine. *Forestry ideas*, *27, 1* (61), 89–100.

[13] Maurer, V., Brovko, F., & Pinchuk, A. (2000). *Guidelines for the study and research of forest crops*. Kyiv: National Agricultural University [in Ukrainian].

[14] Minder, V., Maliuha, V., & Yukhnovskyi, V. (2019). *Meliorate properties of park stands in the conditions of complex relief*. Kyiv: Kondor publishing [in Ukrainian].

[15] Novák, J., Kacálek, D., & Dušek, D. (2020). Litterfall nutrient return in thinned young stands with *Douglas fir. Cent. Eur. For. J.*, *66*, 78–84. https://doi.org/10.2478/forj-2020-0006

[16] Solomatova, E. (2013). Fractional and component composition of forest litters of spruce-bilberry forests in Eastern Fennoscandia. *Forest science*, *6*, 37–46.

[17] Svyrydenko, V., Babich, O., & Kyrychok, L. (2004). *Forestry*. Kyiv: Aristei [in Ukrainian].

[18] Tsvetkova, N., & Yakuba, M. (2011). *Role of forest's ground litter in accumulation and distribution of heavy metals in ecosystems of the middle part of Prysamary Dnieper*. Dnipro: Dnipropetrovsk National University [in Ukrainian].

[19] Vyshenska, I., Zhovtenko, A., & Didukh, Ya. (2010). Methodological aspects of the forest bedding energy storage estimation. *Biology and Ecology, 106*, 40–45 [in Ukrainian].

[20] Voron, V., Sydorenko, S., & Tkach, O. (2018). Structure of forest litter as an indicator of potential fire risk in the pine forests of Polissya, Ukraine. *Forestry and Forest Melioration*, *132*, 115–123 [in Ukrainian]. https://doi.org/10.33220/1026-3365.132.2018.115

[21] Xu, X., Sun, Y., Sun, J., Cao, P., & Ruan, H. (2020). Cellulose dominantly affects soilfauna in the decomposition of forest litter: A meta-analysis. *Geoderma*, *375,* 114508. https://doi:10.1016/j.geoderma.2020.114620

[22] Yakuba, M. (2004). Characteristics of forest litter of biogeocenoses of Prysamary Dnieper. *Issues of steppe forestry and forest land reclamation*, 8 (33), 47–54 [in Ukrainian].

[23] Yukhnovskyi, V., Dudarets, S., Maliuha, V., & Khryk, V. (2013*). Anti-erosion forest plantations of ravine-gully systems*. Kyiv: Kondor publishing [in Ukrainian].

Структурні особливості лісової підстилки водоохоронних соснових насаджень у вологих гігротопах Житомирського Полісся

Андрій Петрович Расенчук, Василь Юрійович Юхновський

Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна

Анотація. Наведено результати дослідження фракційного складу, будови і формування лісової підстилки у водоохоронних соснових насадженнях, які зростають у переважаючих вологих суборевих і сугрудових лісорослинних умовах Житомирського Полісся. Віковий діапазон насаджень коливається в межах 18-85 років. Встановлено, що водоохоронні соснові насадження у вологих гігротопах акумулюють значні запаси лісової підстилки, які коливаються від 33,0 т/га в молодняках до 77,0 т/га в стиглих насадженнях. Розподіл лісової підстилки за площею в більшості насаджень рівномірний, хоча в молодняках її більша частка нагромаджується у міжряддях. За складанням лісова підстилка чистих сосняків характеризується середньою щільною структурою, а в сосняках із домішкою листяних видів підстилка, зазвичай, пухкого складення, що зумовлено наявністю щорічного опалого листя у її верхньому горизонті. Потужність лісової підстилки у міжряддях молодняків коливається у межах 2,6-2,9 см без її чіткого розподілу на горизонти. У середньовікових насадженнях в профілі підстилки чітко виділяються горизонти. Загальна потужність підстилки становить 4,0-4,3 см. У пристигаючих і стиглих соснових насадженнях потужність профілю лісової підстилки коливається в межах 6,0-6,3 см. У насадженнях старших вікових груп лісова підстилка має переважно тришарову будову. Виявлено тренд інтенсивного нагромадження лісової підстилки в умовах вологого субору і сугруду до віку стиглості. У пристигаючих насадженнях нагромадження підстилки уповільнюється, у стиглих насадженнях процеси нагромадження і розкладання підстилки нівелюються. Встановлено тенденцію переважання активної частини і, відповідно, зменшення неактивної фракції підстилки у пристигаючих і стиглих насадженнях вологого сугруду порівняно із суборовими умовами, що свідчить про активніші процеси мінералізації підстилки в умовах вологого сугруду

Ключові слова: склад насадження, вікова група, лісорослинні умови, опад, активна й неактивна фракції підстилки, потужність, мінералізація