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Natural Afforestation of the Fallows in the Western Polissya

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Abstract. One of the main tasks of forestry in Ukraine is to increase forest cover – it can be partially solved by the development of low-productive agricultural land, in particular, fallows, on which self-sown forest is already growing or just appearing, since the expanded reproduction of forests is relevant for Ukraine, considering ecological and forestry transformations of fallows conditioned by their natural afforestation. The main goal was to evaluate the success of natural renewal on fallows in the region under study, to identify factors influencing the course of natural afforestation and tree conservation depending on the location of the plot relative to the forest border and the distance to it. General scientific, forestry and taxation, reconnaissance, forestry and ecological, and geobotanics methods were used to investigate natural renewal at fallows. Office study of materials was carried out using mathematical statistics. As a result of a detailed investigation of the natural settlement of forest tree species on abandoned fields of Western Polissya, it was found that in coniferous and subor conditions, the plots are mostly wooded with pine, as well as birch and alder. In most of the test plots, the renewal was satisfactory (according to the Nesterov scale). The number of self-seeding of tree species in the test plots was not uniform and ranged from 1.2-13.1 thous. units/ha depending on forest site types, species composition, undergrowth size, the abundance of living ground cover, and the degree of sodding of the site and clogging with weeds and grass, which ranged from 20 to 90%. The occurrence of natural renewal is also not uniform: from 19 to 100%. The spread of tree species occurred mainly from forest stands located to the west, northwest, and north of the fallows. The findings of the study are extremely important for employees of the forest industry, and can also be used by territorial communities in improving land management, establishing landscape parks, etc.

Keywords: natural renewal, live ground cover, Drude abundance scale, forestry potential, self-seeding

Introduction

One of the most important tasks for the forestry sector of Ukraine is to increase forest cover and bring it to the optimal level. In part, the problem of low forest cover in Ukraine can be solved by developing low-productive agricultural land, in particular, fallows where self-sown forest grows or appears [1]. In Ukraine, there are about 5 million hectares of land that is not suitable for efficient agricultural use, in particular, 2 million hectares require afforestation in the coming years [2]. Only in the Rivne region, according to [3], there are 7,087.3 hectares of fallows, the afforestation of which would allow increasing the forest cover of Ukraine, but this is impossible, since they are registered as the land of shareholders.

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Given the need to increase the forest cover of Ukraine, the President initiated the Green Country environmental project and issued Decree No. 228/2021 of 07.06.2021 "On some measures to preserve and reproduce forests" [4], which aims to increase the total forest area by 1 million hectares in 10 years and carry out large-scale reforestation in the next three years (plant 1 billion new trees). This, in turn, requires foresters to attract all opportunities and available economic, environmental, and social resources.

Within the framework of the Green Country project, self-sown forests are of great importance, the transfer of which to the subordination of state forestry enterprises with the subsequent implementation of forestry measures in them can ensure an increase in forest cover. Notably, granting self-sown forests the status of a state forest fund is an extremely relevant and important issue today and is not easy from a legal standpoint.

Every year, the area of unsuitable and degraded land, including fallows, increases, and therefore, research into this problem may gain resonance and change attitudes toward self-seeding forests.

Special attention should also be paid to the more complete use of the bioecological potential of forested areas, in particular, the presence of natural renewal, which takes place both in designated and non-designated areas adjacent to forest stands. A characteristic feature of such areas is indirect signs of forest ecosystems, especially in areas adjacent to the northern border of forest cenoses. In such areas, there is often a successful natural renewal of not only pioneer species – birch, aspen, willow, but also pine, spruce, pear, etc. The success of the appearance of natural renewal in such areas depends on many factors: the composition of adjacent tree stands, the frequency of fruiting (seed bearing), the yield of seeds, their ability to move on the area, soil fertility, grass vegetation, etc. As a rule, in the coniferous and subor forest site types in low and more humid areas with indirect signs of forest ecosystems, renewal occurs with silver birch, and in elevated and drier areas – with Scots pine.

The use of natural forestry potential in afforestation of areas with indirect features of forest ecosystems will not only reduce the cost of expanded forest reproduction, but also contribute to improving their biological sustainability. Forests of natural origin are more resistant to adverse factors than artificial ones. Self-seeding forests often combine woodlands that have been separated by fields or pastures.

Nowadays, there is a need to increase the biological stability of plantings and prevent deterioration of their condition in the future, and for this, it is advisable to adjust the current priorities of afforestation in the direction of their greening. In forest development based on the principles of ecological-oriented forestry, integration processes have a significant impact on forest ecosystems, which have significantly intensified since independence, and mainly the ecological significance of the state's forests and the focus on sustainable forestry development [5; 6]. The relevance of the study is conditioned by the importance for Ukraine of expanded forest reproduction and the major significance of ecological and forestry transformations of fallows due to their natural afforestation, and the establishment of biologically stable pine stands.

The purpose of the study was to assess the process of natural afforestation of fallows in Western Polissya and suggest ways to improve afforestation in the region under study with the involvement of areas where afforestation occurred independently, without human participation.

Literature Review

Since 1990, from 5 to 8.5 million hectares of arable land have been withdrawn from cultivation in Ukraine and subsequently converted into fallows [7]. Spontaneous overgrowth of old arable lands goes through various stages of secondary succession towards the meadow-type phytocenoses and the development of forest vegetation, which at the final stages of formation are close to natural phytocoenoses in terms of their systematic structure. For almost a quarter of the 21st century, it was possible to observe an increase in the area of fallows on the territory of Polissya, which were at various stages of autogenic succession – from weed to forest [8; 9]. This makes them a unique testing ground for studying the dynamics of ecosystems under various edaphic conditions under the influence of various external factors [10]. The process of natural afforestation of such fields continues to this day [1].

Notably, in 2022, the Verkhovna Rada of Ukraine adopted the Law [11], which provides for changes to the legislation on the conservation of self-sown forests (natural renewal on non-wooded lands). Now fallows have certain guarantees at the legislative level and are assigned to permanent forest owners.

Solving the problem of biodiversity protection, rational use and restoration of natural vegetation in modern conditions of constantly increasing anthropogenic impact on the environment requires a thorough investigation of the current state of the flora of artificially changed territories in general and dendroflora in particular [12].

Afforestation of low-productive and degraded land is inextricably linked to improving the ecological situation, increasing forest productivity and forest cover, and additional production of a significant amount of wood [3]. Natural landscapes often have less social and agricultural benefits than the local forests and agricultural systems they replace, especially when non-native species dominate succession processes. Agroforestry systems that combine native and foreign culturally important plants represent a potential pathway to increase the social and environmental benefits of unused agricultural land. The results of such studies indicate that fallows have a high potential for recovery through agricultural reclamation [13].

The authors of [14] argue that the process of natural restoration is complex and depends on a number of environmental factors, namely: thickness of the litter, density and closeness of herbaceous plants, vegetation layer, and abundance of fruiting (seed years). The most abundant natural renewal occurs in areas with only weak competition from terrestrial vegetation. The type of forest cultivation system does not significantly affect the amount of natural renewal, but it can be recommended to increase the success of natural renewal by scarifying the soil when using manual seeding to improve germination on the site. This allows increasing the amount of reliable self-seeding and undergrowth by 80%. To protect and preserve vulnerable 1-2-year-old undergrowth and self-seeding of Scots pine, it is necessary to remove weeds and unwanted woody vegetation. Ultimately, the right combination of these measures and their timely implementation will ensure high quality of natural renewal of Scots pine [14].

The intensification of agriculture poses a serious threat to natural biodiversity and related environmental services. Conservation or restoration of semi-natural habitats (forests and fallows) is used to counteract the negative impact of agricultural intensification [15].

M.M. Bilous [16; 17] investigated afforestation of fallows and the influence of grass vegetation on them, plant growth on poor old arable land, and L. Boletus [18] – the role of fallows in preserving the rare fauna that inhabits them. Interesting are the studies by L.P. Lysohor et al. [19-21], who proposed ways to attract fallows as renewable elements of the eco-network, and researchers [22-24], which found recovery sites characterised by significant cenotic diversity [25] and the presence of sozologically valuable species [26-28], and the influence of afforestation of agricultural soils and the species composition of trees on changes in the physical characteristics of the soil [29].

Foreign researchers pay great attention to the study of fallows in terms of the impact of land use changes on the amount of vegetation [30-32], increasing ecosystem functions [33-35], and soil restoration and succession changes [36-38], which are only gaining relevance.

Materials and Methods

The objects of the study were naturally wooded areas on fallows that were located near the woodlands of three forestry enterprises: state enterprise (SE) "Dubrovytsa forestry enterprise (FE)", SE "Sarny FE" and SE "Berezne FE" of the Rivne Regional Department of Forestry and Hunting (RDFH). The research period was 2020-2022.

During the study of natural renewal on fallows, the following methods were applied: general scientific: observation, analysis, synthesis, generalisation, comparison; forestry and taxation – for establishing test plots to determine the taxational specifications of growing stock and investigate the natural afforestation of non-forest lands by tree species; reconnaissance – for finding and establishing test areas on the ground; forestry and ecological – for studying forest and biological characteristics of plantings; comparative ecology – for describing grasses and grass vegetation; methods of geobotanics – for determining forest live cover (FLC) and plant species; modelling, mathematical statistics, and the advanced Microsoft Excel software suite – for processing and analysing experimental materials.

Temporary test areas (TTA) were established according to SOU 02.02-37-476 2006 [39]. Natural regeneration was studied at the discount areas, which were placed evenly over the test site. Their number was 3 units at different distances from the forest border (50, 100, and 150 m). Undergrowth was recorded in a special listing sheet, where the name of the tree species, the number of the temporary trial area (number of the discount area), and the number, height of the undergrowth, and occurrence were indicated.

According to the height, the undergrowth was divided into: small – the height of the undergrowth was up to 0.5 m; medium – 0.51-1.5 m; large – more than 1.5 m [40]. By density, the following were distinguished: sparse undergrowth – up to 3 thous. units/ha; medium density – from 3 to 8; dense – from 8 to 13; very dense – more than 13 thous. units/ha. By occurrence: uniform – occurrence is more than 65%; uneven – from 40 to 65%; group – if the in groups contain at least 10 units of small or 5 units of medium and large specimens of viable and closed undergrowth [40].

The size of discount areas was set depending on the density and height of the undergrowth: if the undergrowth was small and dense, then the size of the discount area was 4 m^2; if the undergrowth was medium in height and density, then the size of the discount area was 10 m^2; if the undergrowth was large and sparse, then the size of the discount area was 20 m^2 [41].

When processing field materials, only viable undergrowth was included in the calculations. Renewal assessment and assistance measures were determined for each test area. First, for each sample, the total amount of viable undergrowth was summed up for all discount areas, after which it was recalculated per 1 ha using the equation:

$$N = n\frac{10000}{p}, \quad (1)$$

where N – the number of undergrowth per 1 ha, units/ha; n – the number of undergrowth on all discount areas, units; p – area of all accounting platforms, m^2.

After determining the total number of undergrowth, its height group was established according to the following principles: the undergrowth is considered small if specimens up to 0.5 m high make up more than 2/3 of the total number; the undergrowth is considered large if specimens over 1.5 m high make up more than 1/3 of the total number; in other cases, the undergrowth is considered medium-sized.

After the predominant group of undergrowth heights on the area was established, the undergrowth of other height groups was transferred to the predominant group of heights according to the corresponding conversion coefficients (Table 1) [42].

Table 1. Coefficients of conversion of undergrowth of different height groups to the predominant one

Predominant group of undergrowth heights	Transfer coefficients for undergrowth height groups		
	large	medium	small
large	1.0	0.8	0.5
medium	1.25	1.0	0.625
small	2.0	1.6	1.0

When describing the forest live cover, the species composition and abundance of undergrowth were determined according to the method of G.M. Vysotskyi, modified by the authors [42].

The distribution of forest live cover is determined using the Drude abundance scale:

Soc – plants cover more than 3/4 of the area; Cop^1 – plants cover from 1/2 to 3/4 of the area; Cop^2 – plants cover from 1/4 to 1/2 of the area; Cop^3 – plants cover from 1/20 to 1/4 of the area; Sp – plants cover less than 1/20 of the soil surface, but are still significantly widespread; Sol – plants occur singly; Un – only one specimen was found.

To calculate and assess the success of natural renewal on fallows, 45 discount areas were established on 15 temporary test areas (3 plots on each test area). Discount area dimensions – 10 m^2 each, since the medium-sized undergrowth prevailed. Samples were taken in plots adjacent to different forest site types. The influence of forest live cover on the soil and the state of natural renewal on fallows were also analysed.

After counting renewal trees according to the V.G. Nesterov scale, the success of natural regeneration of trees in the test areas was assessed according to the scale of M.M. Gorshenin, A.I. Shvydenko, modified by V.M. Maurer and I.V. Kimeichuk [42; 43].

Results and Discussion

The region under study contains quite a lot of land that is not used for its intended purpose, and where the forest environment is fully formed, that is, these are full-fledged stands, although they are located on the lands of shareholders or reserve lands. Temporary test areas were established in these areas (Fig. 1).

Figure 1. General view of natural renewal of Scots pine on fallows

The authors analysed the features of afforestation of fallows depending on the side of the forest border abutment; taxation specifications of undergrowth and its age structure were established; the influence of forest live cover on afforestation of plots was investigated; proposals for afforestation of land unsuitable for agricultural use were developed. A summary of the characteristics of forest live cover and natural renewal in test areas, and recommended measures to promote natural renewal are given in Table 2.

Table 2. Characteristics of natural renewal of tree species on fallows

TTA No.	Basic tree species	Assessment of FLC abundance according to the Drude abundance scale	Undergrowth size category	Number of natural seeding, thous. units/ha	Occurrence, %	Assessment of renewal success	Recommended measures to promote natural renewal
1	pine	Cop^3	Medium	3.0	50	satisfactory	Additional sowing or partial planting of seedlings/saplings
2	pine	Cop^2	Medium	4.1	60	satisfactory	Additional sowing or partial planting of seedlings/saplings
3	pine	Cop^2	Medium	11.6	100	good	Not required
4	pine	Cop^2	Medium	4.4	65	satisfactory	Partial planting of seedlings/saplings
5	pine	Cop^2	Small	13.1	100	good	Not required
6	pine	Soc	Small	5.6	39	insufficient	Additional sowing or partial planting of seedlings/saplings
7	pine	Soc	Small	2.9	19	bad	Planting by seedlings/saplings
8	birch	Cop^2	Large	2.6	65	satisfactory	Not required
9	alder	Cop^3	Medium	4.1	65	satisfactory	Partial planting of seedlings/saplings
10	alder	Cop^3	Medium	3.3	65	satisfactory	Partial planting of seedlings/saplings
11	birch	Cop^2	Large	1.8	39	insufficient	Partial planting of seedlings/saplings
12	birch	Cop^3	Large	2.5	65	satisfactory	Not required
13	pine	Soc	Large	1.2	40	insufficient	Planting of seedlings/saplings
14	pine	Cop^2	Medium	4.6	65	satisfactory	Additional sowing of seeds
15	pine	Sor^4	Small	11.3	100	good	Not required

Source: compiled by the authors

Data from Table 1 show that in 8 of the 15 test areas, the natural renewal of tree species was satisfactory (according to the Nesterov scale); in three areas – good and insufficient (unsatisfactory); in one – bad. The number of self-seeding tree species on test areas is not uniform and varied: for pine – in the range from 1.2 thous. units/ha (TTA No. 13 – large pine) up to 13.1 thous. units/ha (TTA No. 5 – small pine); for birch (only large undergrowth) – from 1.8 thous. units/ha (TTA No. 11) up to 2.6 thous. units/ha (TTA No. 8); for alder – medium undergrowth in the amount of 3.3-4.1 thous. units/ha (TTA No. 9-10). The settlement of tree species occurred mainly from forest stands located to the west, northwest, and north of the fallows. Factors that influenced the distribution of tree species and their development (type of forest stand conditions, distance to the forest border, seed years) also affected their number and occurrence, which is also not the same: from 19% (TTA No. 7) to 100% (TTA No. 3, 5, 15).

Fallow lands that have not been used for their intended purpose for a long time have a significant degree of sodding and infestation with weeds and grass. At the test sites, the grass cover occupied from 20% (TTA No. 15) to 90% (TTA No. 7) of the area. Severe sodding of certain areas (TTA No. 6, 7, 11, 13) complicated the process of natural renewal by tree species. Young trees often compete fiercely for nutrients and moisture on poor soil.

To investigate the taxation specifications of natural renewal on fallows, 4 temporary test areas were established in areas where the forest border was adjacent from different parts of the world (Table 3).

Table 3. Success of the natural renewal of pine trees depending on the connection of the forest border to the site and its taxation specifications

Side of the forest border adjacent to the plot	FST*	Distance to the forest border, m	Taxation specifications of natural pine renewal									
			number of plants, units/ ha	height, m			diameter, cm			increment, cm		
				min	max	χ**	min	max	χ	min	max	χ
North	B_2	50	11,450	2.70	6.35	4.44	1.25	11.75	4.46	23	89	47
		100	5,750	2.12	6.73	4.19	1.25	11.00	4.71	21	85	47
		150	3,150	1.47	7.08	2.96	1.00	10.00	3.85	22	88	45
South	B_3	50	9,450	0.76	7.53	3.43	1.25	9.50	2.94	17	98	57
		100	4,250	1.00	2.30	2.63	1.25	8.25	3.22	15	82	55
		150	1,500	0.50	2.53	1.38	0.40	2.75	2.63	13	71	37
West	A_2	50	9,850	1.50	7.00	3.61	1.00	11.25	5.10	16	75	44
		100	5,050	1.70	6.93	2.63	1.00	13.75	3.79	19	81	52
		150	2,550	1.45	4.95	3.16	1.00	9.00	3.90	24	84	50
East	A_3	50	11,700	0.10	10.55	2.39	0.10	11.50	2.46	5	103	39
		100	6,800	0.20	6.25	1.80	0.20	10.50	1.72	10	85	42
		150	1,400	0.10	3.40	0.96	0.10	4.50	1.00	9	55	22

Note: * FST – forest site type; **χ – arithmetic mean

As can be seen from Table 3, as the distance from the forest border increases, the biometric indicators of undergrowth decrease. They are highest in trees in areas where the forest border is adjacent to the north and west and which are located in fresh coniferous and subor conditions. According to the number of new trees, there are areas with the forest borders in the north and east. Pine trees aged 1 to 8 years and older were found in the test areas (Table 4) with different percentages by age groups, depending on the side of the forest border abutment and distance from it.

Table 4. Distribution of natural renewal of pine trees by age depending on the distance to the forest border and the side of its abutment

Side of the forest border adjacent to the plot	Age structure of renewal (%) depending on the distance to the forest border (m)								
	50			100			150		
	<3 years	4-8 years	⩾9	<3 years	4-8 years	⩾ 9	<3 years	4-8 years	⩾9
North	0	26	74	0	31	69	3	48	49
South	6	85	9	1	90	9	7	93	0
West	0	64	36	4	65	31	0	70	30
East	59	8	33	76	10	14	79	21	0

Source: compiled by the authors

As can be seen from the data in Table 4, on the fallows to which the forest adjoins from the south and west, the largest 4-8-year natural renewal of pine in all test areas, slightly less than the older 9 years and very few young shoots and 1-3-year renewal. If the forest is adjacent from the north, new trees at the age of 9 years and older prevail, and young trees at the age of 1-3 years are detected only at a distance of 150 m from the forest border. In the area where the forest border was adjacent to the east, the age structure of renewal is radically different – 1-3-year-old prevails (from 59 to 79%), and at a distance of 150 m from the forest, there is no renewal aged 9 years and older.

A forest environment has already been established in the areas under study, so a number of forestry measures should be implemented to form a full-fledged forest stand, similar to the indigenous one in these conditions. This can be mineralisation or tillage with furrows or strips with or without sowing seeds of the necessary tree species. Attention should be paid to the mineralisation of the soil in strips after 2-3 m. In areas with intensive sodding, it is better to cultivate the soil with furrows with a PKL-70 plough to a depth of 20-25 cm or strips (PKL-70+KLB-1.7). In areas adjacent to the pine forest, in low-yielding years, it is advisable to plant pine seeds with manual seed drills in places where there is no natural renewal, but before that it is necessary to loosen the soil with heavy harrows. Using the natural forestry potential of such plots (in particular, natural renewal, which is intensively appearing on the lands of shareholders and reserves that have been in a state of fallow for a significant time) in order to increase forest cover will save a significant amount of money and allow creating new forests that will be biologically sustainable, more productive, with better biodiversity, and better adapted to climate change.

A number of forestry measures should be implemented on self-forested fallows to establish a full-fledged forest stand. This can be mineralisation of the soil in strips after 2-3 m or cultivation of the soil with furrows or strips with or without planting the necessary tree species, depending on the success of natural renewal on the site.

State authorities should simplify the scheme of transferring agricultural land that is not being used for its intended purpose and is empty, on which spontaneous forests have already settled, and where only forest service can carry out forestry activities and care for them professionally. By comparing the findings of this study with the results of other researchers in the same area, it was found that the natural afforestation of fallow lands is generally satisfactory, but the predominant in the plantings of Chernihiv Polissya are mostly secondary tree species, such as birch, aspen, alder [17]. Natural plantings of seed origin on fallows have uneven crown closure.

The species composition of the dendroflora of the fallow lands of the Pridnestrovian Podillya includes 52 species of woody and shrubby plants [44], which is explained by the richness of forest conditions in the region. The researchers also claim that the establishment of anthropogenic ecotones is observed over time between forest areas and fallows, provided that they are very close.

According to M.M. Bilous [16; 17] on fallows in the conditions of Chernihiv Polissya, the silver birch is better restored naturally, its seeds spread up to 300 m from the forest border, while the seeds of Scots pine reach up to 200 m, but the researcher states that a relatively satisfactory renewal of pine occurs in a 100-metre strip near the forest, and birch – at 160 metres. At a distance of up to 100 m from the mother plant, the amount of self-seeding of pine trees was 1-5 thous. units/ha, which is 2-5 times less compared to the results of this study (4.3-11.7 thous. units/ha). At a distance of 100-150 m, the amount of self-seeding of pine trees decreases sharply, but the same dependence remains: 0.4-1 thous. units/ha [17] against 1.5-4.5 thous. units/ha.

Somewhat similar results were obtained by V.A. Zakharchuk45] in Zhytomyr region. According to the researcher, only 6-8-year-old self-seeding of Scots pine was found in the amount of 2.4 thous. units/ha at a distance of up to 50 m from the forest border, 2.2 thous. units/ha – up to 100 m, and 2.1 thous. units/ha – at a distance of up to 150 m, i.e., there is a slight decrease in the amount of self-seeding with increasing distance from the forest border. Such data differ significantly from the findings of this study, according to which the number of self-seeding at a distance of up to 50 m is 4-8 times greater than the number at a distance of 100-150 m and almost at each of the intervals there is an undergrowth aged from 1 to 9 years or more, although 4-8-year-old self-seeding prevails in all areas.

Other researchers [46] also state the fact that the amount of self-seeding depends on the distance to the forest borders. Thus, the largest number of young trees was observed at a distance of 20 m from the forest border. Self-seeding on this test area is characterised by the highest (compared to others) average age, that is, at first it appeared closer to the forest border, and every year it occupied more and more area. A characteristic feature of its distribution on fallows is a pronounced grouping. The area of the plot between the self-seeding groups practically does not contain woody plants of natural origin, but only isolated specimens are found.

Similar results were obtained by other researchers [47], who considered the state of afforestation of fallow lands and the species composition of forest live cover. Their results confirm that the species composition of forest live cover, especially ruderants and protants, competes with young trees and strong sodding worsens their condition and biometric indicators (height, diameter, and growth of the current year).

M. Malashevskyi, O. Malashevska [48] investigated the processes of natural afforestation of fallow lands and their subordination and recommended, as in the previous studies, special measures to promote natural renewal, which would ensure its relatively rapid closure and increase the area of mixed plantings of natural origin, resistant to negative climatic and other factors.

Conclusions

Natural renewal on fallow lands that are not used in agriculture occurs with the main and accompanying tree species, in particular, pine, birch, and alder, but not always evenly and in sufficient quantities.

The number of pine renewal ranged from 1.2 thous. units/ha (large undergrowth) to 13.1 thous. units/ha (small undergrowth); birches – from 1.8 thous. units/ha to 2.6 thous. units/ha (only large undergrowth); alders – from 3.3 to 4.1 thous. units/ha (medium undergrowth). The number and occurrence (spread) of forest renewal is affected by: forest site type, distance to the forest border, seed years, amount of forest live cover, and the degree of soil sodding.

Fallow lands that have not been used for their intended purpose for a long time have a significant degree of sodding at the sites under study, the grass covered from 20 to 90% of the area. Severe sodding of certain areas has complicated the process of natural renewal by tree species in these areas.

Natural renewal on abandoned fields (fallows) mainly occurs in areas adjacent to forest on the north and west sides. At the same time, this renewal is also characterised by better average biometric indicators, which decrease with increasing distance from the forest wall.

On the fallow areas, to which the forest adjoins from the south and west, there is the largest number of 4-8-year-old natural renewal of pine trees, somewhat less of older than 9 years, and very few 1-3-year-old trees. If the forest is adjacent from the north, new trees at the age of 9 years and older prevail, and young trees at the age of 1-3 years are detected only at a distance of 150 m from the forest border. In the area where the forest border was adjacent to the east, 1-3 year-old undergrowth prevails, and at a distance of 150 metres from the forest there are no trees aged 9 years and older.

A characteristic feature of self-forested fallow lands are indirect signs of forest ecosystems. It is established that the success of natural renewal is influenced by: composition of the adjacent forest stand, frequency of its seed bearing/fruiting, yield, the ability of seeds to move to large areas, soil fertility, contamination, etc.

The next studies are intended to investigate the process of successive changes in the fallow areas, the NPK content in the soil, the range of forest live cover (silvants, pratants, ruderants), and expand the network of test areas in other forest site types on the fallow land that was not covered by this study.

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Природне заліснення перелогових земель Західного Полісся

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Анотація. Одне із головних завдань лісового господарства України – підвищення лісистості – частково може бути вирішене освоєнням низькопродуктивних сільськогосподарських угідь, зокрема перелогів, на яких уже зростає чи тільки з'являється самосійний ліс, оскільки актуальним для нашої держави є розширене відтворення лісів з урахуванням еколого-лісівничих трансформацій перелогових земель, внаслідок їх природного заліснення. Основною метою було оцінити успішність природного поновлення на перелогових землях в регіоні досліджень, виявити фактори впливу на перебіг природного заліснення і збереження дерев залежно від розташування ділянки відносно стіни лісу та відстані до неї. Для дослідження природного поновлення на перелогах використано загальнонаукові, лісівничо-таксаційні, рекогносцирувальні, лісівничо-екологічні, геоботанічні методи. Камеральну обробку матеріалів здійснено методом математичної статистики. У результаті детального вивчення природного заселення лісових деревних видів на перелогових землях Західного Полісся, встановлено, що у борових і суборових умовах ділянки заліснюються здебільшого сосною, а також березою і вільхою. На більшості пробних площ поновлення виявилося задовільним (за шкалою Нестерова). Кількість самосіву деревних видів на пробних площах не однорідна і коливалася в межах від 1,2-13,1 тис. шт./га залежно від типу лісорослинних умов, виду деревних рослин, категорії крупності підросту, рясності живого надґрунтового покриву і ступеню задерніння ділянки та засмічення бур'янами і трав'яними рослинами, який на об'єктах коливався від 20 до 90 %. Трапляння природного поновлення також неоднакове: від 19 до 100 %. Заселення деревними видами відбувалося здебільшого від насаджень, розташованих із західної, північно-західної та північної сторін від перелогів. Результати дослідження є надзвичайно важливими для працівників лісової галузі, а також можуть бути використані територіальними громадами в удосконаленні землеустрою, закладенні ландшафтних парків тощо

Ключові слова: природне поновлення, живий надґрунтовий покрив, шкала Друде, лісівничий потенціал, самосів