UDC 630*22+630*42

STRUCTURE OF THE MAIN FOREST FORMATIONS OF THE NATIONAL NATURAL PARK "HUTSULSHCHYNA"

Losyuk V.P., a researcher,

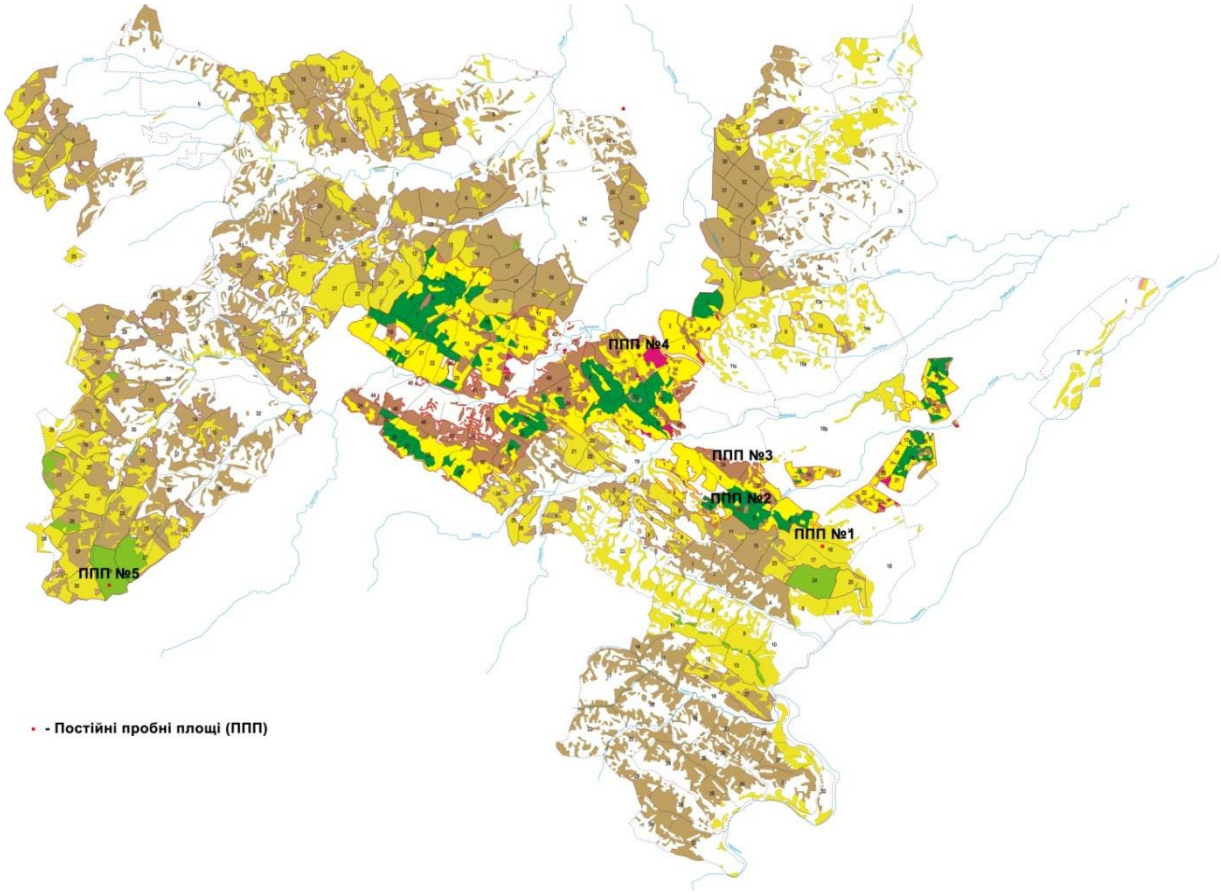
The National Natural Park "Huzulschyna", town Kosiv

The main forest formations of the National Natural Park "Hutsulshchyna" are explored - oak, silver fir, beech, spruce European, that is structure state of life, the success of natural regeneration. The state and dynamics of drying derivatives of spruce in the Park is studied, noted their progressive character and an increasing number of spruce seedlings as a drying stand.

The forest foundation, forest formations, the structure, damaging, natural regeneration, derived spruce.

The total forest area of the National National Park "Hutsulshchyna" is 32,271 hectares, of which 7606 hectares are given to it in a constant use. It represents 74.3% of forest land area of Kosiv district, where the main forest users, besides the park are DP Kutske lisove hospodarstvo and Kosiv RP "Rayahrolis" (pic.1). Ground covered by forests cover about 96% of the total area of the park. All the forests of the park are divided into economic, adjustable and fixed recreation and reserved areas. Leaves wood occupy 77% of the removed territory of the Park and pine - 23%. Other species do not exceed more than 15%.

Predominant species in the forests of the park "Hutsulschyna" are beech (66% of the area), spruce - 11.8%, silver fir - 10.4%, oak - 7.6%. We can say that for the main species in the area provided by the Park in constant use are characterized by better index than the territory of other users of the area - the area that is in the Park without exception has beech stands - 49%, spruce - 29, fir - 6, oak - 6, hornbeam - 4, gray and black alder - 3% [10;11].



Picture 1. Layout of PTA on the Park "Hutsulshchyna"territory.

By the age structure in the Park is dominated middle-aged stands (87%), young trees occupy 8, middle ripe - 3, ripe and overripe - 2.0%. The average age of the Park stands is 79 years old. Forests, on the territory, are given to the permanent use to the Park - it's mostly indigenous high-stands, middle class growth is 1.1, average fullness - 0.67, stock 306 m3/ha and the growth - 4.6 m3/ha per year . The most common types of forests in the Park are: wet spruce-fir beech- 21% of the area; wet spruce beech - 9; wet spruce-fir beech - 10; wet beech-spruce fir - 9; moisture hornbeam- 6; wet spruce beech – 9 and moisture beech - 6% of forest land.

The purpose of the research - the studing of structure, status and dynamics of the major forest formations in the Park "Hutsulshchyna", the current state and dynamics of drying derivatives of spruce plantings.

Materials and methods of research. Considering the variety of forest plants, existence of rare and valuable species in the Park "Hutsulshchyna" are founded 4 permanent test areas (PTA) in the major forest formations (pic. 1, table 1.). During the inventories of the stand, underbrush, undergrowth, deadwood, grass cover were used traditional forestry and forest inventory techniques [2,6].

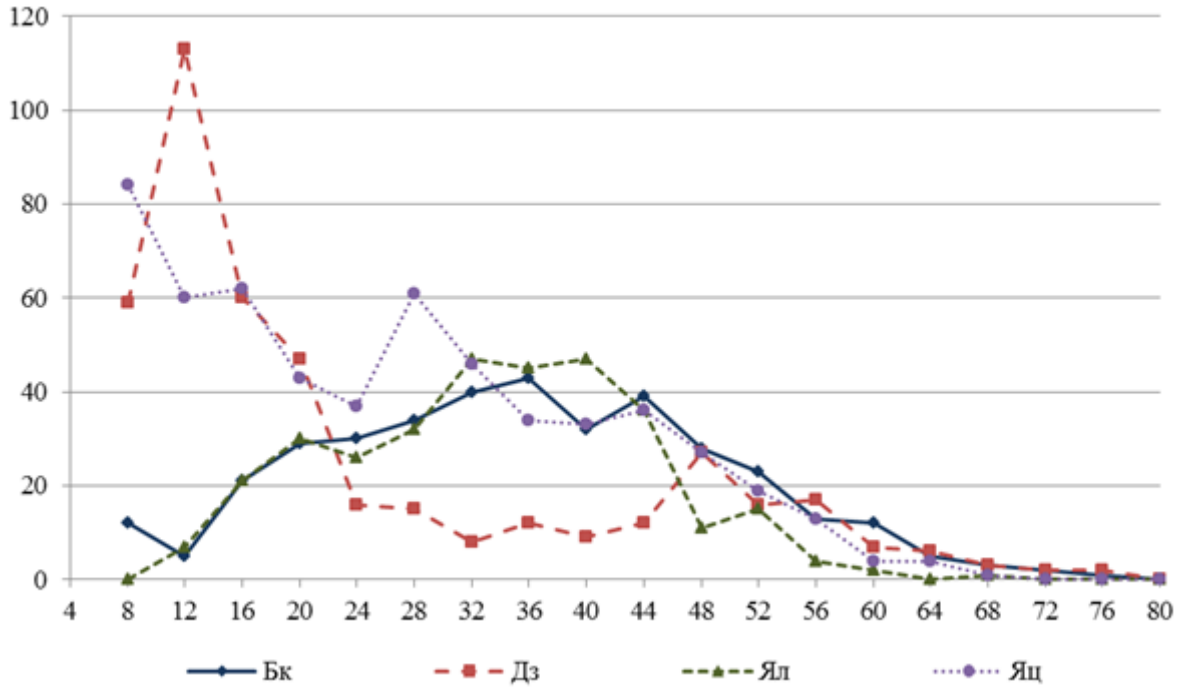
Table 1

Characteristics of the permanent test areas (PTA)

№ PTA	Composition of the stand	Number trees	Age,years	Completeness	Worthiness	Height, m Max.	Height, m average	Diameter, max. cm	Diameter, average cm
1	6PO 4NS+SlL, HB,SF	268	103	0,5	I	36,5	23,0	90,2	27,9
2	10CB	362	110	0,7	I	35,0	30,0	80,0	40,0
3	7SF3CB+NS,HB	563	85	0,7	I	38,0	24,0	66,0	30,2
4	10 SF	491	115	0,9	II	37,5	28,9	74,0	36,8

Research results. One of the most valuable thing in forest cover of Precarpathia is the formation of oak [8]. To study the oak formations in the Park "Hutsulshchyna" laid PTA1 on the territory of botanical nature monument "Tsuhanivske" (block 16, section 6, Starokutske PNDV). This association is identified as hazel -blackberry beech oak forest. The area is 1 hectare (a square with sides of 100 m). The territory is located 330 meters above sea level at brown, gley soils. The stand of the natural oak forests of the Park is three circles, close to the traditional multi-age spruce- hornbeam and spruce oak forest (pic. 2). 1 circle is an oak with spruce (8PO 2NS) and a supply of 310 m3/ha. Height of the 1 circle

is about 30 m, age of the oak - 150 years (300), spruce - 90 years, fullness 0.54. On the second circle is dominated a spruce with fir, linden and hornbeam (7NS3SF +HB,SIL), and the stock is 70 m3/ha. The height of the second circle 24-26 m, age 60-80 years, 0.07 fullness. In the third circle grow mainly hornbeam and linden (6HB4SIL + SF,NS), and its stock is about 30 m3/ha. Height of the III circle - 16 m, age - 40 years, fullness - 0.1.

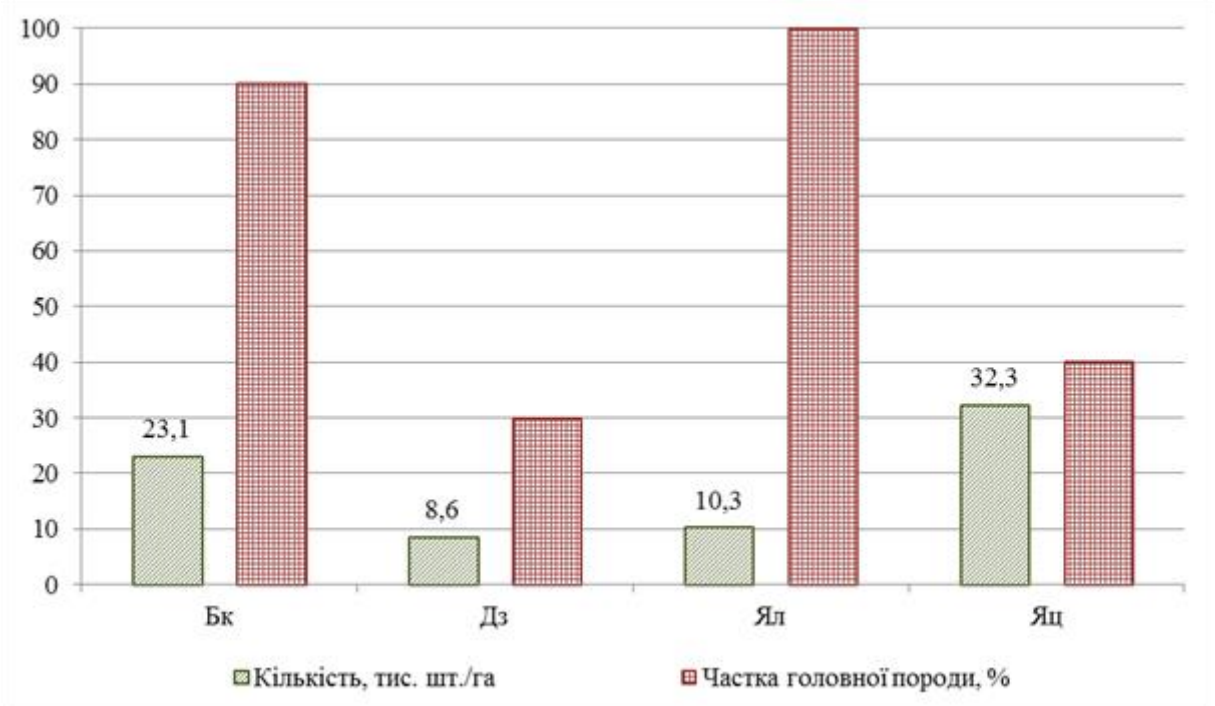


Picture 2. Dividing of trees by diameter in main forest formations in the Park "Hutsulshchyna"

It is noted a very significant range of fluctuations diameters of most species in natural oak forests in the Park "Hutsulshchyna": 36 116sm oak, linden 8-56 cm, 12-44 sm spruce This proves that the age of the trees stand is different. Most of species is growing in a first class, exception is a beech - II creditworthiness.

The condition of the forest stands in PTA1 is satisfactory, the number of undamaged by illnesses and pests trees is more than 50%, while the least damaged are trees of beech and hornbeam, despite the fact that they are in subordinate circle. Oak and fir trees are not hurt about one third, and the percent of healthy spruce trees about 20%.

Near the forest are mostly hazel and elder. Total number of undergrowth is 8.6 th. p./ha, its composition is 3PO4SIL3HB + SM,CB (pic.3). General projective grass cover of herbs is 60-70%. and includes 29 species of vascular plants among which Zelenchuk, shamrock and blackberry dominate. Bedding of "Mul" type has a thickness of 1-2.5 sm, formed by leaves of oak (40%), branches (30%), acorns, cones (18%) and chopped organic. A location of trees on a sample has a group character, biogroups of thick trees and gaps with a little trunks.



Picture 3 – A number of natural regeneration in the PTA and the share of main stand in it.

To study the most common in the park beech PTA 2 was established in "Homynske" (block 8, section 9, Starokutske PNDV). This is beech formation, association of kvasenytsevo-marenkovoho beech forest. The sample area is of 1 hectare (a square with side of 100 m). The sample is located on the south-eastern

slope of 35 degrees at the altitude of 540 m above the sea, soil - brown soil. Studies show that the trees in natural beech forests in the Park are located in three circles, although the margin of the third layer is not enough (table 1). On the diagram the division of trees by the diameter clearly shows the presence of one clear peak for beech wood for trees with a diameter of 36 sm and two not clear - to 20 degrees of thickness and 60 sm (pic. 2), so this stand can be conditional uneven. In general, living trees of the beech forests in the Park form stand by such characteristics: rock composition – 10CB+NS,SF; completeness - 1.25; beech diameter - 38.7 sm spruce - 11.5, fir - 8.8 sm, and height, respectively - 29.6, 14.6, 12.6 m; class beech growth class - and, spruce - II, fir - I; stock wood - 585 m3/ha.

Dry trees of beech have such characteristics: average diameter - 25.1 sm, height - 13.0 m; stock - 4.3 m3/ha.

State of the beech forests in the National Natural Park "Hutsulshchyna" is good: the percent of trees without damage is 76.9 for beech, spruce - 100 ,and fir also 100%. The most damaged are the trees of the third circle - almost 30% in the first a little less - 22.5, and the least - in the second (20.0%). The most (60.5%) dead stock is in the first stage of decomposition, 16 percent - in the second and another 23.5% on the third stage of decomposition. Dry stage of the fourth stage is absent. Taking into account a very low supply of dead wood we can say about high biological stability of studied stands.

The most (45.8%) stock lying of dead wood is in the third stage of decomposition and almost the same (40.3%) – in the fourth, 7.7 percent - in the second and 6.1% - in the first stage of decomposition. Such dividing of dead wood on the degree of decomposition indicates on a great drying out of trees, which took place 10-15 years ago.

Important from the point of understanding the processes of natural developing of beech forests is to analyze the success of natural regeneration [4;9]. And mostly it shows that the number of seedlings is sufficient for natural regeneration of native stands (22 thousand pieces/ ha), and composition of young trees – 9CB1NS+SF (pic. 3). Worth to note a good representation of related species, good condition

regrowth (no damage) and an equal dividing by the high-altitude group. In the grass cover in PTA2 there are 12 species of higher vascular plants: zubnytsya bulbysta, Vesnivka bifolia, common sorrel, anemone Dubravnaya, woodruff, ozhyka forest, crow's eye, violet wood, geranium Robert, including 3 types which are listed to the Red Book of Ukraine: hnizdivka usual, bulatka longifolia, dear bifolia.

Formations of the fir forests of the Park "Hutsulshchyna" are studied in the tract "Under Klyfa" (block 10, share 31 PNDV of Kosiv). The area of PTA is 1 hectare and is located on the north-west slope at an altitude of 520 m above the sea level. Association - blackberry spruce-beech-fir forest. This 3-circled native stand of different ages with species composition 7SF 3CB + NS,HB and fulness 0.67, Ia creditworthiness and supply of 527 m3/ha (pic. 2, Table 1.). Regrowth 9SF1CB + NS,HB,CB. They are characterized by 3 age zones - age 2-5 years, height 0.3 - 1m, 3,5 ths. pieces/ ha age, 5-10 years, height 1.5 m, 5.5 ths. / ha, , more than 10 years, higher than 2 m - some specimens (pic. 3). Uploaded uneven, most of it is in the gaps, viable seed origin amount of young trees are largely sufficient to form a new generation of forest [11].

Undergrowth in the sample presented some elderberry bushes, hazel of 1.5-2 m height. Grass cover is represented by 31 views of vascular plants, 2 types of which are in the Red Book of Ukraine, and their projective cover - 80%. In terms of forestry, natural fir forests are in good condition, the number of healthy trees are 63%. Natural succession of native stands of fir forests are complex and help to the formation close to the natural stands by its composition and performance and stability.

In the Ukrainian Carpathians are predominant formation of European spruce [1].To study the characteristics of the structure, status and dynamics of natural spruce forests in the National Parks in 2010 PPP5 was set in Kosmach Forestry Enterprise (block 29, board 24). The sample (1 ha) is located at the top of the slop north-west, impetuosity - 5-10 degrees at an altitude of about 1350 meters above sea level. The type of the forest – is wet clean fir forest. Spruce stands of natural

spruce forests are characterized by a complex vertical and horizontal structure and combination on the relatively small areas of trees of different age, diameter and height. The position of the trees in the area is irregularly-group with presence of no distinct gaps between groups, which is timed appearance of undergrowth. Total number of growing trees is 492 pcs. / ha [5].

For vertical structure ¬ stand is of many circles (pic. 2, table 1.). Trees are clearly divided into two layers, and the third stage is represented only by individual trees. A significant amount of different diameters of spruces is a sign of a wide age of the range. Analysis of tree rings showed that the age of the oldest trees is up to 150 years. Creditworthiness with completeness - 0.92 is of II stand. Mean values of diameter and height are different in different circles, but the wood stock of the third stage is insufficient for its release in taxation plan. However, these single trees of the third circle are important in the context of forest management and in analyzing of the dynamics of the trees structure in general.

Forest analysis of natural spruce was conducted by class IUFRO, the method is described in detail in the publications of the authors [10]. Class of the circles (mean - 1.4) confirms that in general the stand is two layed, and the third stage is represented badly. Class vitality has a natural dynamic in terms of circles: first - high viability (1, 3); second - close to good (1.7); third circle - good (2.0). The average index of vitality for the whole stand is 1. 4, that is closer to the high. This means that most of the trees have good or high vitality and the degradation of natural spruce of Kosivschyna now is weak. Having of dry wood is necessary for the reference forests to natural forests. Dry wood stock is about 15 percent of the stock of living trees, which is normal for these conditions. According to the results of the research, on the sample is about 300 pc. / ha of dead trees on a stock about 130 m3/ha, which is above the average for virgin, but normal for a succession of natural spruce forests.

In general, natural regeneration of spruce is successful (10062 pcs. / ha) and it is able to ensure the development of a new generation of forest.

The near forest layer is represented by single red elderberry shrubs with an average height of 1.5 m. The projective cover of grasses and mosses of spruce in Kosivschyna is 95%. Totaly counted 29 species of herbs and three species of moss.

To study the dynamics of drying spruce we derivatived PTA3 was set in the tract "Golytsa" (block 24, section 21 Starokutskoho PNDV). This is association of spruce formation and fir forest blackberry. The sample area of 1 ha is located on the northern slope of 150, height of 700 meters above sea level. Stands is a single-stage derived from fir species composition 10NS+F,CB,HB, completeness 0.7, an average height of 21 m, diameter 26 sm, margin - 320 m3/ha. An average characteristics of spruce at different stages of drying are presented in Table 2.

During the last five years fullness decreased from 0.7 to 0.4 (nearly 50%), while from 1998 to 2005 years, the decrease was less than 13% (at 0, 8 to 0.7). Even more reduced the number of trees - from 430 to 164, or 62%. In fact, the PTA is standed in a completely disordered trees stand, in the center of which there is the oval gap of size 65 to 47 meters, in which live spruce trees are absolutely absent. During the researching this gap is completely overgrown with hazel, willow, mountain ash and elderberry and is a kind of remiz for wild animals. Only at the edges of the sample stand is preserved by the spruce, but its part is gradually reduced by increasing the share of pine and larch.

For ten years, the number of natural regeneration increased from separate plants to 7 thousand/ha. This suggests that in the place of this deranged stand will appear new and what is very important – naturally [3].

Grass cover has a projective cover 60% and consists of 21 species of vascular plants, 4 of which are in the Red Book.

Table2

Average characteristics of the original spruce at different stages of drying

Year	composition of species	Average		fulln ess	credi twort hines	Stock, m3/ha	Regrowth	
		H m	D, sm				The number	compositio n of rocks

					s		of thousand pcs.	
1998	10NS+F, M	16	18	0,8	I	290	-	-
2005	10NS+F,SB,HB, M,O,SM	22	25	0,7	I	352,6	0,8	5NS3SF 1CB1B
2009	9NS1F+M,CB,H B,Y	24	29	0,4	II	148,3	7,0	6NS1CB1S F1PO 1HB+F

Conclusions. The structure of hornbeam - linden oak forests of Kosivschyna is complex - three circles with five species in a stock. Their resistance is enough high, but restoring in the natural way - long and complicated. The natural succession of native oak forests causes the formation of complex and persistent stands.

The main elements of the structure of natural beech forests: relevance forest type; complete dominance of beech in species composition; the presence of two full storeys and the third, which is forming; high creditworthiness, especially the third circle; high completeness, particularly the first circle; high stock of wood of living trees and low of dead ones; low percent of damaged trees, especially spruce and fir; good vitality, the highest in the fir trees; preference of trees of dominant position; prefer of luxury and useful trees, especially beech; high marketability, especially beech; average length of the crown of beech, in fir the longest; very successful natural regeneration.

The structure of native spruce and beech is too complex - three storeys and in its composition is 4-8 species. A characteristic feature of these stands is low completeness of the first circle because of spruce weakening and dominance of the second layer, which is associated with increased position of beech and a successful natural regeneration.

Natural fir forests in Kosiv with complex vertical and horizontal structure are preserved only in the most inaccessible high altitude at an altitude of 1200 meters above sea level and transport the unavailability of certain forest areas promote saving. From the all forest formations of the National Natural Park "Huzulschyna" pure alpine spruce is least changed by natural forest ecosystems with almost no signs of human activity and therefore they can be set to the conditional virgin forests.

These results indicate that after 2005 drying of spruce is progressing much faster than it was after 1998, it is indicated by a sharp decrease in the number and completeness of trees. A positive point in drying of spruce derivatives is an increasing number of seedlings.

Literature:

1. Holubets M.A. Firs of Ukrainian Carpathians / M.A. Holubets- Kyiv: Naukova Dumka - 1978. - 264 p.

2. Grom M.M. Forest taxation: a textbook. [for high school students] M. M.Grom - Lviv: UkrDLTU, 2005. - 352 p.

3. Principles of sustainable development of Kosivschyna / G.D. Hutsulyak, V.P. Losyuk, S. Shparyk and etc. - Chernivtsi: Pub. house "Prut", 2005. - 208 p.

4. Molotkov P.I. Beech forests / P.I. Molotkov. – M.: Lesna., 1966. - 224 p.

5. Parpan T.V. The state structure and dynamics of pure spruce forests in Kosivschyna / T.V. Parpan, Y.S .Shparyk, V.P. Losyuk / / Forest magazine., № 2, 2011. - p. 19-23.

6. Svyrydenko V.E. Forestry: a textbook. [for high school students] / V. Svyrydenko, O.H. Babich, L.S. Kirichok. - K .: Aristey, 2005. - 544 p.

7. Smaglyuk K.K. Aboriginal leaves forestformers / K.K. Smaglyuk. - Uzhgorod Carpathians, 1974. -120 p.

8. Stojko S.M. Forest cover . Oak Forests / S. M. Stojko / / Ukrainian Carpathians. Nature. - K.: World, 1988. - p. 64-72.

9. Shparyk Y.S. Structure of the Beech Forests of the Ukrainian Carpathians / Shparyk Y.S., Kommarmot B., Berkela Y.Y. - Snyatyn "Prut-print", 2010. - 143 p.

10. Shparyk Y.S. The structure and condition of oak forests in Kosivschyna / Y.S. Shparyk, V.P. Losyuk / / Forestry and agroforestry. - Kharkiv: Ukr.NDILHA, 2012. – 120. - p. 31-36.

11. Shparyk Y.S. The structure and status of silver fir stands in Kosiv / Y.S. Shparyk, V.P. Losyuk / / Scientific Bulletin of National Forestry University of Ukraine. - Lviv, 2009. - № 19-5. - p. 42-48.

12. Shparyk Y.S. Characteristics of sustainability of forests and methods of its determination / Y.S. Shparyk / / Scientific Bulletin of National Forestry University of Ukraine. - Lviv, 2012. - № 22.3. - p. 58-63.