RECREATIONAL AND HEALTH FORESTS OF KREMENETS DISTRICT, TERNOPIL REGION

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The article presents the results of the research of recreational and health stands in Kremenets district of Ternopil region. The total area of these forests is 5868.2 hectares.

Studies of the typological structure of the forests were carried out according to the methods of Alekseev-Pohrebniak Forest Typology of Forestry Ecological School. MapInfo Professional 12.0 and a vector map of Ukraine were used to construct a map-scheme of the research region.

The typological variety of recreational and health-improving stands is represented from subors (B) to dubravas (D). Thus, dubravas are the largest share among them (72.9% of the total area covered with forest vegetation). The share of the area of sudubravas is 17.7% of the total area covered with forest vegetation; the rest is subors (9.4%).

Forest managers have identified 14 types of forests on the territory of the research facility. Thus, there are only 2 types of forest in the subors, 8 types of forest in the sudubravas and 4 types of forests in the dubravas.

The most common type of forest in Kremenets district is fresh hornbeam forest represented 71.6% of the total area covered with forest vegetation. The share of fresh hornbeam-oak-pine forest reaches 17.1%; a slightly smaller share is represented by fresh oak-pine subors — 9.4%.

The forest species diversity is represented by 22 species of trees. Thus, among these tree species, the largest area is occupied by Common Oak (Quercus robur L.) — 40.6% of the total area covered with forest vegetation, and 29.1% — by Scots Pine (Pinus sylvestris L.).

Stands of artificial origin (78.0% of the total area covered with forest vegetation) are dominant; the rest of stands have natural origin (22.0%).

The age structure of stands is unbalanced. Middle-aged stands dominate (57.9% of the total area covered with forest vegetation). The share of maturing, young and matured forests ranges from 9.0 to 14.9% of the total forest area.

In terms of relative completeness, stands with a density of 0.71−0.8 dominate which is 37.7% of the total area covered with forest vegetation. The share of stands with completeness of 0.61−0.7 (29.9%) and 0.81−0.9 (14.5%) is slightly smaller.

The bonitete classes are dominated by stands of the I bonitete class — 51.3% of the total area covered with forest vegetation. Thus, the share of II, Ia and III bonitete classes varies from 7.1 to 23.3% of the total forest area.

Keywords: *stands, forest type, forestry and tax indicators, forest typology, relative completeness, bonitete class.*

INTRODUCTION

Recreational and health forests include forest areas, «which perform recreational, sanitary-hygienic and health-improving function, they are used for tourism, sports, sanatorium treatment and recreation of the population and located:
• within cities, towns and other localities;
• within the districts of sanitary protection of medical and health territories and resorts;
• within the strips of sanitary protection zones of water bodies;
• in the green zone forests around the towns and cities;
• outside the green zone forests»[10].

The aim of the study was to analyze the distribution, typological and forestry-taxation structure of recreational and health forests in Kremenets district.

ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

The study of recreational and health forests has been revealed in the scientific works of V.P. Voron [5], S.I. Myklush [6], M.M. Kutia [4], I.F. Kalutsky [3], T.S. Pavlovskaya [8], M.R. Pytulyak [9], S.I. Musienko [7], T. Gerstenberg [11], J. Oppliger [12], G.S. Russo [13], H. Tavárez [14], L. Tuffery [15], L. Tyrväinen [16] and others.

The area of recreational and health stands in Ternopil region reaches 27 thousand hectares. Thus, the largest area of forests is concentrated in the central part of the region — in SE «Ternopil FE» (12.4 thousand hectares) and SE «Chortkiv FE» (7.9 thousand hectares). Stands is an important component of biotic resources used for recreational and tourist activities in the Ternopil region very actively [9]. However, it is still important to conduct complex research to study the typological and forest-taxonomic structure of recreational and health forests in Kremenets district of Ternopil region.

MATERIALS AND RESEARCH METHODS

The analysis of various cartographic materials (topographic, vector maps, atlases) and forest management materials (taxonomic materials, afforestation plans) was conducted in order to study the recreational and health forests in Kremenets district of Ternopil region.

The MapInfo Professional 12.9 geographic information system and the vector map of Ternopil region with a detailed refinement on 1: 25000 scale maps were used to highlight the boundaries of Kremenets district.

The research of the typological and forestry-taxation structure of recreational and health stands was carried out on the basis of the materials of the excretory database of PA «Ukrderzhlisproekt» (as of 01.01.2016). The database has 1505 quarters. Conversion of database files of the production association «Ukrderzhlisproekt» from *vff format into *mdb format was carried out with the help of the developed program of UkrRIFFM named after G.M. Vysotsky [2].

Forestry-typological analysis of forests was carried out in accordance with the main methodological provisions of forestry-ecological (Ukrainian) school of forest typology [2].

RESULTS AND DISCUSSION

The research covered the forest fund of forestry enterprises within Ternopil region. Geographical coordinates of the extreme points of the research region: in the North — 26°13′28″, 50°16′07″, in the South — 25°56′45″, 49°41′57″, in the West — 25°21′02″, 50°0′15″ and in the East — 26°16′29″, 50°06′22″ (Fig. 1).

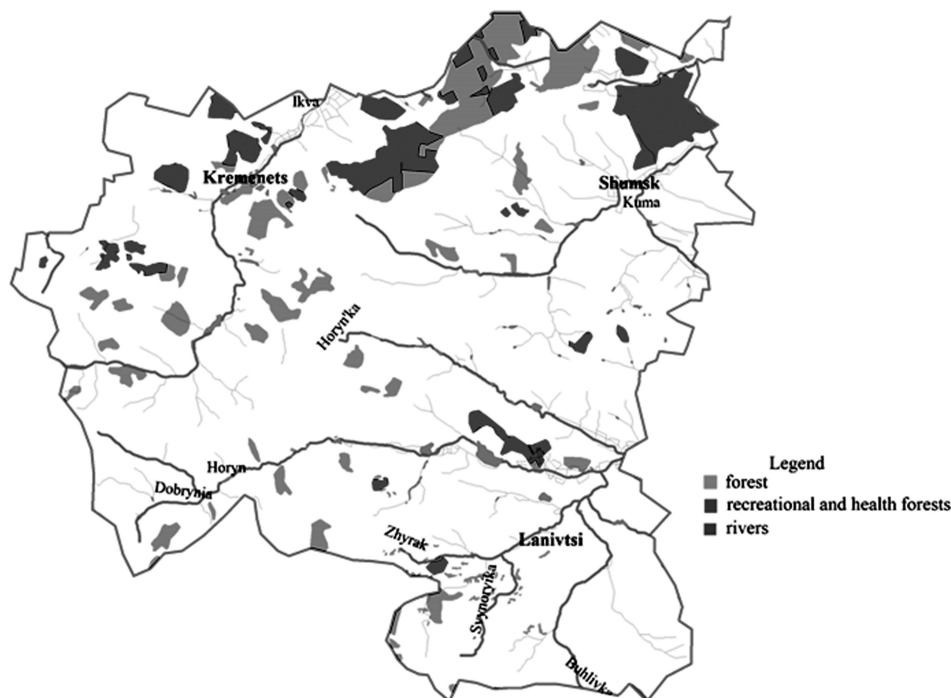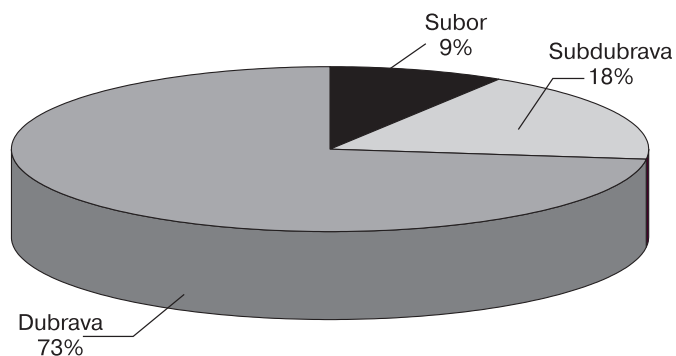The total area of the studied forests is 5868.2 hectares which are subordinated to the

Fig. 1. *Scheme-map of recreational and health forests of Kremenets district*
Source: developed by the authors based on their own research.

Fig. 2. *Distribution of the area of recreational and health forests according to the trophotopes*

Source: PA «Ukrderzhlisproekt» database (as of 01.01.2016).

State Agency of Forest Resources of Ukraine. The trophogenic series from subors to dubravas has been represented on the territory of the research object. Among the trophotopes the largest area is occupied by s — 72.9%. The share of the area of sudubravas is 17.7% of the total area covered with forest vegetation, the rest are subors — 9.4% (Fig. 2).

As a result of the analysis of the areas of stands on the territory of the research object according to the hygrotopes, it was determined that the subors are represented by fresh and moist hygrotopes. Thus, their share is 9.4% of the total area covered with forest vegetation.

In Kremenets district fresh and moist hydrotopes predominate in the composition of sudubravas. Thus, the share of fresh dubravas is 17.3% of the total area covered with forest vegetation. The share of dry, moist, damp and wet hygrotope occupy small areas (up to 1.0% of the total forest area).

Dubrvas are represented by dry, fresh moist and damp hygrotopes. Thus, fresh dubrava occupies 71.6% of the total area covered with forest vegetation. The total share of dry, moist and damp dubravas is approximately 1.2% of the total area covered with forest vegetation.

The analysis of the distribution of the area covered with forest vegetation according to the forest types shows that the most common type of forest on the research territory is fresh hornbeam dubrava (D_2-hD), represented 71.6% of the total area covered with forest vegetation.

Fresh hornbeam-oak-pine sudubrava (C_2-hoS) occupies 17.1% of the land covered with forest vegetation. A large area of the research terrtory is occupied by fresh oak and pine subor (9.4%) amd moist hornbeam wood (1.2% of the total area covered with forest vegetation).

The share of moist oak-pine soubor (B_3-oP), dry eroded sudubrava (C_1-Oe), fresh hornbeam dubrava (C_2-hD), moist hornbeam dubrava (C_3-hD), moist hornbeam-oak-pine sogrud (C_3-hoP)), fresh hornbeam-pine sudibrova (C_3-hpS), damp black alder sudubrava (C_4-A), wet black alder sudbrava (C_5-A), dry hornbeam dubrava (D_1-hO) and damp black alder grud (D_4-A) (Table 1).

The species diversity of forests on the territory of the research object is represented by 22 species of trees. Thus, among these tree species the largest area is occupied by Common Oak (*Quercus robur* L.) — 40.6% and Scots Pine (*Pinus sylvestris* L.) — 29.1% (Table 2).

The share of Hanging Birch (Betula pendula Roth.), Common Hornbeam (*Carpinus betulus* L.), Red Oak (*Quercus rubra* L.), Pseudoplatane Maple (*Acer platanoides* L.), European Larch (*Larix decidua* Mill.), European Spruce (*Picea abies* (L.) H. Karst.) and Common Ash (*Fraxinus excelsior* L.) ranges from 1.3 to 7.3% of the total area covered with forest vegetation. The area of the other 13 tree species is only up to 3.0%.

The territory of the research object is dominated by the forests of artificial origin (78.0% of

Table 1

Distribution of the area of recreational and health forests according to the forest types

Types of forests	Area	
	acre	%
Fresh oak and pine subor	552,1	9,4
Fresh hornbeam-oak-pine sudubrava	1005,2	17,1
Fresh hornbeam dubrava	4203,7	71,6
Moist hornbeam dubrava	70,4	1,2
Others	36,8	0,7
Total	5868,2	100,0

Source: PA «Ukrderzhlisproekt» database (as of 01.01.2016).

Distribution of the area of recreational and health forests according to the tree species

Tree species	Area	
	acre	%
Hanging Birch	93,5	1,6
Common Hornbeam	476,1	8,1
Common Oak	2384,3	40,6
Red Oak	224,6	3,8
Pseudoplatane Maple	118,2	2,0
European Larch	73,5	1,3
Scots Pine	1708,1	29,1
European Spruce	193,3	3,3
Common Ash	431,2	7,3
Others	165,4	2,9
Total	5868,2	100,0

Source: PA «Ukrderzhlisproekt» database (as of 01.01.2016).

the total area covered with forest vegetation), the rest — of natural origin (22.0%).

Recreational and health forests of Kremenets district are divided into two subcategories (Fig. 3). Thus, among them the largest share is represented by the stands of forestry part of green zones (90.4% of the total area covered with forest vegetation), 9.4 times smaller is the area of the forest-park part of green zone forests (9.6%).

According to the results of the study conducted on the research object it was established that the forest fund is characterized by an unbalanced age structure of forests (Fig. 4). Thus, the share of middle age forests is the largest (57.9% of the total area covered with forest vegetation).

The share of maturing, young and mature forests ranges from 9.0 to 14.9% of the total forest area.

The completeness of stands is one of the most important factors that characterizes the level of performance of protective, water-regulating and recreational and health functions of the forest. Thus, the ratio of the shares of precipitation that will be retained by tree crowns, evaporation from tree crowns and transpiration depends on completeness. When increasing the completeness from 0.2 to 0.8 there is a significant reduction in surface runoff — almost 10 times.

The distribution of the area of recreational and health forests in Kremenets district is quite diverse (Fig. 5). Thus, stands with the density of
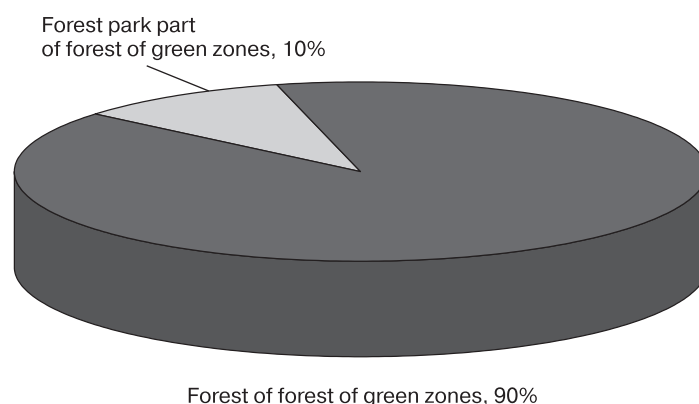

Forest park part
of forest of green zones, 10%

Forest of forest of green zones, 90%

Fig. 3. *Distribution of the area of recreational and health forests according to the subcategories, %*
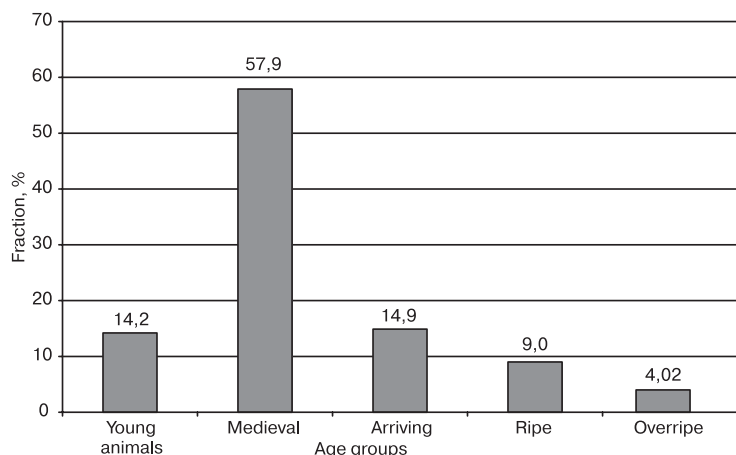*Source*: PA «Ukrderzhlisproekt» database (as of 01.01.2016).

Fig. 4. *Distribution of the area of recreational and health forests according to the age groups, %*

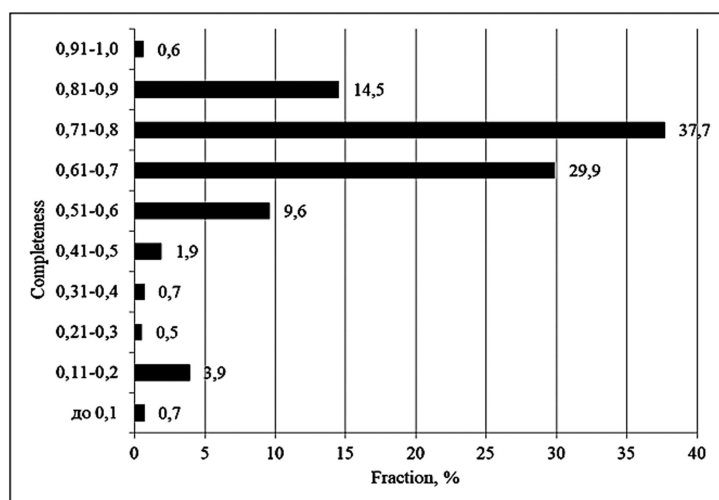*Source*: PA «Ukrderzhlisproekt» database (as of 01.01.2016).

Fig. 5. *Distribution of the area of recreational and health forests according to the completeness, %*

Source: PA «Ukrderzhlisproekt» database (as of 01.01.2016).

0.71−0.8 dominate, which is 37.7% of the total area covered with forest vegetation.

Stands with the density of 0.61−0.7, 0.81−0.9 and 0.51−0.6 occupy 29.9, 14.5 and 9.6% of the total forest area, respectively. The share of completeness from 0.1 to 0.5 and 0.91−1.0 is negligible.

The analysis of the distribution of the area of stands according to the completeness proves that the structure of treestands on the territory of the research object is dominated by the stands with the density close to optimal in the hydrological and recreational sense.

There are 9 quality classes on the territory of the research object (Fig. 6). The distribution of stands according to the bonitete classes is quite different. Thus, stands of the first bonitete class dominate (51.3% of the total area covered with forest vegetation).

The share of II, Ia and III bonitete class varies from 7.1 to 23.3% of the total forest area. In general, the share of other bonitete classes is only 4.2% of forests.

CONCLUSIONS

The total area of recreational and health stands of Kremenets district is 5868.2 hectares. Among them there are two subcategories: forestry part of forests of green zones (90.4% of the total area covered with forest vegetation) and forest park part of forests of green zones (9.6%).

The typological structure of recreational and health stands is represented by 14 types of forests. Among them, the most common are fresh hornbeam (71.6% of the total area covered with forest vegetation),
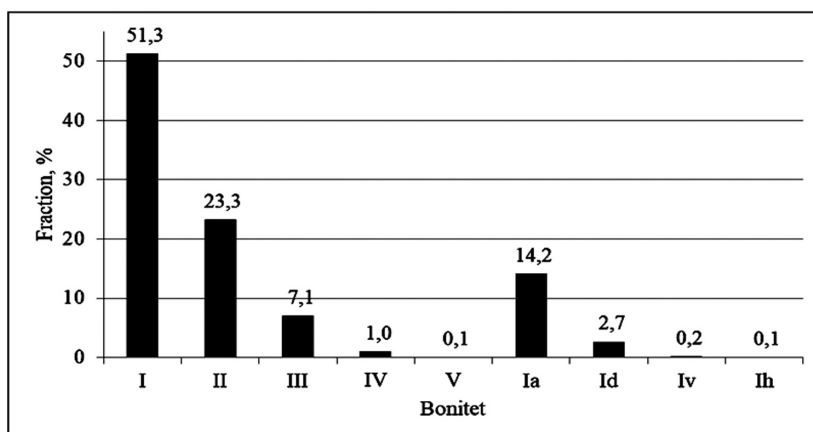

Fig. 6. *Distribution of the area of recreational and health forests according to the classes of bonitete, %*

Source: PA «Ukrderzhlisproekt» database (as of 01.01.2016).

fresh hornbeam-oak-pine sudubrava (17.1%) and fresh oak-pine subor (9.4%).

Species diversity of recreational and health stands is characterized by 22 species of trees. They are dominated by Common Oak (40.6% of the total area covered with forest vegetation) and Scots Pine (29.1%).

The age structure of recreational and health stands is unbalanced. Middle age stands dominate (57.9% of the total area covered with forest vegetation). The share of maturing, young and mature forests varies from 9.0 to 14.9%.

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РЕКРЕАЦІЙНО-ОЗДОРОВЧІ ЛІСИ КРЕМЕНЕЦЬКОГО РАЙОНУ ТЕРНОПІЛЬСЬКОЇ ОБЛАСТІ

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У статті наведено результати досліджень рекреаційно-оздоровчих насаджень на території Кременецького району Тернопільської області. Загалом площа цих лісів становить 5868,2 га.

Дослідження типологічної структури лісів здійснювали за методикою лісівничо-екологічної школи лісової типології Алєксєєва-Погребняка. Для побудови карти-схеми регіону дослідження використовували програму MapInfo Professional 12.0 та векторну карту України.

Типологічне різноманіття рекреаційно-оздоровчих насаджень представлено від суборів (В) до грудів (D). Так, серед них найбільшою часткою представленні груди (72,9% від загальної площі вкритої лісовою рослинністю земель). Частка площі сугрудів становить 17,7% від загальної площі вкритої лісовою рослинністю земель, решта — субори (9,4%).

На території дослідного об'єкта лісовпорядниками виділено 14 типів лісу. Так, у суборах виділено лише 2 типи лісу, сугрудах — 8 типів лісу та грудах — 4 типи лісу.

Найбільш поширеним типом лісу на території Кременецького району є свіжа грабова діброва, яка представлена на площі 71,6% від загальної площі вкритої лісовою рослинністю земель. Частка свіжого грабово-дубово-соснового сугруду сягає 17,1%, дещо меншою часткою представлений свіжий дубово-сосновий субір — 9,4%.

Видове різноманіття лісів представлено 22 видами дерев. Так, серед цих деревних порід найбільшу площу займають дуб звичайний (Quercus robur L.) — 40,6% від загальної площі вкритої лісовою рослинністю земель та сосна звичайна (Pinus sylvestris L.) — 29,1%.

Домінують насадження штучного походженням (78,0% від загальної площі вкритої лісовою рослинністю земель), решта насаджень — природного походження (22,0%).

Вікова структура насаджень є розбалансованою. Домінують середньовікові насадження (57,9% від загальної площі вкритої лісовою рослинністю земель). Частка пристигаючих, молодняків та стиглих лісів коливається від 9,0 до 14,9% від загальної площі лісів.

За відносною повнотою домінують насадження з повнотою 0,71–0,8, що складає 37,7% від загальної площі вкритої лісовою рослинністю земель. Частка насадження з повнотою 0,61–0,7 (29,9%) і 0,81-0,9 (14,5%) є дещо меншою.

За класами бонітету домінують насадження I класу бонітету — 51,3% від загальної площі вкритої лісовою рослинністю земель. Так, частка II і Iа та III класів бонітету варіює від 7,1 до 23,3% від загальної площі лісів.

Ключові слова: *насадження, тип лісу, лісівничо-таксаційні показники, лісова типологія, відносна повнота, клас бонітету.*

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