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Landscape Principles of Optimization of Functional Zoning of «Hutsulshchyna» National Nature Park

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Abstract. The main purpose of the study is to optimize the functional zoning of the «Hutsulshchyna» National Nature Park on the basis of a landscape approach. To begin with, a map-scheme of modern functional zoning in the ArcGIS 10.0 software environment was digitized, and analysis and mathematical calculations were performed. On the basis of a

pre-concluded landscape map at the level of simple tracts in the scale of 1:25 000, on the key area Brusnyi, according to the method of field landscaping of H.P. Miller's mountain areas, we have optimized in detail the functional zoning of the park in a key area. Some changes have been made regarding zoning in other areas of the National Park, only less detailed, as the compilation of a landscape map of the local level for the entire territory of NEC «Hutsulshchyna», which is a very long and complex process. In addition to the landscape approach, according to which the boundaries of functional zones must coincide with the boundaries of natural territorial complexes of a certain rank, we tried to take into account the Law of Ukraine «On Nature Reserve Fund of Ukraine» and «Nature Chronicle Program for National Parks of Ukraine». Ideally, the protected area should be in the middle, surrounded with a zone of regulated recreation, and only then the economic zone. The protected area should not border the economic one. According to the IUCN, the protected area and the regulated recreation zone must occupy at least 75% of protected area, but often in practice these requirements are difficult or even impossible, as each protected area has its own geographical features. Since the park is located in a hilly area, the economic zone should not be allocated on the ridges and upper parts of the slopes, because the effects of anthropogenic impact in the economic zone will be more or less manifested in the protected area, which is at the lower hypsometric level. Analyzing the functional zoning in the key area of Brusnyi, it was found out that in addition to the geographical location of the zones, the areas of the functional zones have also changed significantly. Thus, the protected area was 15.1%, and became 25.1%, regulated recreation – 34.2%-41.9%, stationary recreation area – 0.01%-0%, economic zone – 51.1%-33%. The advantage of the proposed zoning is the complexity, which makes it possible to protect fully and completely and use rationally the natural territorial complexes of the Pokut Carpathians. After all, natural complexes are a system, and it is known that in the system, when one component is destroyed, the whole system is destroyed. For the first time, on the basis of a landscape map at a scale of 1:25 000 at the level of simple tracts, proposals were submitted that will improve the existing functional zoning of the territory of NEC «Hutsulshchyna». The results of research can be used by the administration of NEC «Hutsulshchyna» in the development of re-functional zoning during the creation of a new project organization of NEC «Hutsulshchyna», the Department of Nature Protection, Research, and the Department of Recreation and Landscaping.

Key words: Hutsulshchyna National Nature Park, nature reserve fund, landscape approach, functional zoning, optimization, Pokut Carpathians.

Ландшафтні засади оптимізації функціонального зонування НПП «Гуцульщина»

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Анотація. Метою дослідження є – оптимізація функціонального зонування Національного природного парку «Гуцульщина» на основі ландшафтного підходу. Попередньо проведено польові ландшафтознавчі дослідження за матеріалами яких з

допомогою сучасних Гіс-технологій укладено ландшафтну карту на рівні простих урочищ в масштабі 1:25 000 на ключову ділянку «Брусний». Оцифрована карто-схема сучасного функціонального зонування в програмному середовищі ArcGIS 10.0., де здійснений аналіз просторового розміщення функціональних зон обраховано їх площу та відсотки. З допомогою вище згаданих цифрових технологій, векторні шари (shapefile) карта функціонального зонування, ландшафтна карта, космоснімок були накладені один на один в результаті чого вдалося запропонувати зміни до меж функціональних зон згідно ландшафтного підходу, який передбачає цілісність, комплексність і нерозривність природних комплексів. Під терміном комплексність слід розуміти не тільки нерозривність природних територіальних комплексів, а й нерозривність і компактність функціональних зон. Межі функціональних зон за можливості повинні співпадати з межами природних територіальних комплексів. При оптимізації функціонального зонування, крім ландшафтного підходу, був взятий до уваги закон України «Про природно-заповідний фонд України» та «Програма Літопису природи для Національних парків та заповідників України». Зміни щодо функціонального зонування були зроблені у гірській частині парку, зокрема біля гори Грегит, де знаходяться старовірові ліси, на хребтах Карматура, Брусний, Сокільський, Хоминський, Каменистий та в урочищі Хоминське. Більш детальна оптимізація функціонального зонування запропонована на ключовій ділянці «Брусний», яка знаходиться в Шешорському природному науково-дослідному відділенні. Згідно сучасного зонування заповідна зона становить – 15,1 %, зона регульованої рекреації – 34,2 %, стаціонарної рекреації – 0,01 %, господарська – 51,1 % (рис. 3). За результатами запропонованих змін заповідна зона становитиме – 25,1 %, зона регульованої рекреації – 41,9 %, господарська – 33 % (рис. 4). При цьому межі зон проведені по межах природних територіальних комплексів, витримано концентричність розміщення зон. При оптимізації функціонального зонування парку, вперше застосовано ландшафтний підхід при якому використано ландшафтну карту масштабу 1:25 000 в поєднанні з цифровими технологіями. Впровадження в практику отриманих результатів ефективно та дієво вплине на функціонування природно-заповідного об'єкту, зокрема на його господарську діяльність. Перевага запропонованого зонування – це комплексність, яка дає можливість цілісно і повноцінно охороняти та раціонально використовувати природні територіальні комплекси Покутських Карпат. Результати досліджень можуть бути використані адміністрацією НПП «Гуцульщина» при розробці повторного функціонального зонування під час створення нового повторного проекту організації НПП «Гуцульщина», відділом служби державної охорони, науково-дослідним, а також відділом рекреації та благоустрою території при створенні туристичних стежок та еколого-пізнавальних маршрутів. Оптимізація функціонального зонування НПП «Гуцульщина» підвищить ступінь охорони різних ландшафтів в типологічному відношенні, оскільки на досліджуваній території присутні як низькогірні так середньогірні типи ландшафтів.

Ключові слова: Національний природний парк «Гуцульщина», природно-заповідний фонд, ландшафтний підхід, функціональне зонування, оптимізація, Покутські Карпати.

Introduction.

With the rapid development of society and the need for a comfortable human life, natural resources are being exploited more and more intensively, which do not always have the ability to recover. Reserves, national parks and other nature conservation sites of local significance are being created to preserve and protect valuable landscape complexes. To date, 52 national parks have been created in Ukraine, but, unfortunately, the landscape approach (National Nature Parks of Ukraine, 2020) is not always used in their creation and development of functional zoning, that fully protect valuable landscape complexes. Functional zoning in national parks plays an extremely important role in the preservation and reproduction of natural complexes, as it is based on certain environmental, recreational activities. Analyzing the current functional zoning of the studied area, it was found that in most cases, the boundaries of functional zones did not take into account natural boundaries, and part of the same natural complexes may be in different areas under different protection regimes. For example, on one slope (natural territorial complex of a certain rank), and not large in area, according to modern functional zoning, there are three zones: the upper part is an economic zone, the middle one – is stationary recreation and the lower part of the slope – protected

area (south-eastern part on Brusnyi key area). Carrying out certain actions within the economic zone, the impact will occur on the territory that is assigned to another zone, even timber transportation will be carried out through the protected area, not to mention the further consequences, erosion, topsoil wash off, changes in physical-chemical properties. Therefore, when developing functional zoning, it is necessary to apply a landscape approach, which involves continuity, complexity and integrity, because the change of one component leads to a change of another and ultimately to a change of the whole natural complex. As the landscape approach is beginning to be widely used in the creation and optimization of protected areas and is justified, there is a need to improve the functional zoning of Hutsulshchyna NNP, as the largest protected area in Pokut Carpathians. In recent decades, considerable attention of scientists has been focused on the creation and optimization of nature reserves, and Ukraine is not an exception. Detailed characteristics of the management of national parks are presented in the works of M.M. Kukurudza (M.M. Elbakidze), in particular, focuses on the activities of national parks in Western Europe, where parks are mainly characterized by the following set of zones: absolutely protected, regulated recreational use, limited land use, economic land use and active management (Kukurudza, 2003). N. Hul, B.V. Senchyna, and

B. Ya. Khomyn gave a rather detailed description of the functional zoning of some national parks in the Carpathian region where it was determined that the creation of functional zoning should apply an ecological and landscape approach, where the purpose of zoning should be to protect not just certain species of plants or animals, but to preserve geosystems and processes occurring in them as a habitat for endangered species. In the first stage, when creating a zoning, a landscape map at the level of simple tracts of 1:25 000 must be drawn up (Hul, Senchyna, Khomyn, 2005). Publications on this topic can be found in V.P. Brusak, Y.V. Zinko, M.A. Maidanskyi works, who develop and describe in detail the functional zoning and its priorities in the national parks of the Carpathian region (Brusak, Zinko, 2011; Brusak, Maidanskyi, 2013). Analyzing these works, we can conclude that the functional zoning of Hutsulshchyna NNP is still based on the traditional environmental and economic approach, and not on ecological and landscape-scientific (landscape), which is based on a comprehensive analysis and assessment of the diversity of natural landscapes (Brusak, Maidanskyi, 2013). Studying the modern functional zoning of the park, it was found that in its development, the smallest territorial units were forestry departments, the boundaries of which often do not coincide with the natural boundaries. It was found that the functional zoning of the park was not developed on the basis of a landscape approach, which may have been due to the lack of a large-scale landscape map. Detailed landscape substantiation of optimization of the National Natural Parks of Ukraine on the example of Nyzhnosulskyi and Oleshkiv Sands National Nature Parks is covered in the dissertation research of A.O. Splodytel (Splodytel, 2018). Proposals for optimizing the functional zoning of Skole Beskydy National Nature Park on the basis of a landscape approach are substantiated in detail in the dissertation of O.O. Burianyk «Ecological and landscape analysis of Skole Beskids» (Burianyk, 2019).

The aim of the study is to analyze the modern functional zoning of Hutsulshchyna National Nature Park and on the basis of the landscape structure of the territory to propose a more improved division of the park into functional zones, based on the Law of Ukraine «On Nature Reserve Fund» and «Nature Chronicle Program for National Parks of Ukraine».

Materials and methods of research.

Detailed landscape field studies were carried out on the key area of Brusnyi and other territories of the National Park according to the method of field

landscape survey of mountain territories, H.P. Miller (Miller, 1996). The result was a digital landscape map at the level of simple tracts at a scale of 1:25 000 (Hostiuk, Melnyk, 2018). The next step was to digitize the map of existing functional zoning in the ArcGIS 10.0 software environment and create an attribute table that stores all the data about the object that can be analyzed and visualized using such tools as Statistics, Field Calculators, Calculate Geometry in the attribute table was calculated area, the percentage of functional areas in accordance with the total area of the park. Subsequently, vector layers (shapefile) map of functional zoning, landscape map, space image were superimposed on each other, which made it possible to determine where the boundaries of functional zones are not on the landscape principle, i.e. the boundaries of functional zones do not coincide with natural territorial rank of complexes. The last step was to propose clarifications and some changes in the boundaries of functional zones based on the landscape map according to the landscape approach, the Law of Ukraine «On Nature Reserve Fund of Ukraine» and «Nature Chronicle Program for National Parks of Ukraine». The following methods were used to achieve this goal: cartographic, expeditionary, descriptive, modeling, and aerospace. Modern digital GIS technologies, in particular ArcGIS 10.0 software, were used at all stages of the research.

Results and discussion.

The largest conservation site in Pokut Carpathians is Hutsulshchyna National Nature Park (32,271 ha), established by Presidential Decree No. 456 of 14 May 2002 in Kosiv District of Ivano-Frankivsk Region (Prorochuk, Stefurak, Brusak, Derzhypilskyi, 2013). The lands of Hutsulshchyna National Nature Park include lands of Kosiv inter-farm forestry (now it's Kosiv district enterprise «Rayahrolis») with an area of 10709 ha and lands of Kutsk state forestry (now it's a state enterprise «Kutsk forestry») with an area of 21562 ha (Prorochuk, Stefurak, Brusaki, Der, 2013). It is worth noting that the park did not include meadows, which are located among forests and settlements.

Hutsul National Nature Park is one of the largest nature reserves in Pokut Carpathians, but it does not represent fully the diversity of landscapes, and cannot fully protect and reproduce unique landscape complexes, to carry out scientific and educational and recreational activities due to a number of shortcomings that were admitted during its creation. The first and main shortcoming, which was allowed when creating the park – is the creation of the park is not a landscape

approach, large cluster, where the park is almost scattered in small pieces between settlements and lands of other forest users in Kosiv district (Hutsulshchyna National Nature Park, 2009 Brusak, Maidanskyi, 2006). The second, no less important shortcoming is that there are three forest users on the territory of Hutsulshchyna National Nature Park, and the territories provided for permanent use of the park occupy only 23.5% (7606 ha) of the entire territory of Hutsulshchyna National Nature Park. Brusak, Derzhypilskyi, 2013). Some valuable areas of ancient forests have not been transferred to the lands provided to the park for permanent use, but they are located on the lands of other forest users and, accordingly, cannot be fully protected. Third, functional zoning is not based on a landscape approach and compliance with all legal norms.

Since 60% of the territory of Hutsulshchyna National Nature Park and 79.3% of the territory provided to the park for permanent use are located in Pokut Carpathians, there is a need to optimize the functional zoning of Hutsulshchyna National Nature Park. Taking into account the landscape structure of the park, landscape principles of nature management and the Law of Ukraine «On the Nature Reserve Fund of Ukraine», the authors have proposed some clarifications to the functional zoning of Hutsulshchyna National Nature Park. For this purpose, the key area of Brusnyi was selected, which is located within the territory provided to the park for permanent use. The territory is typical for Pokut lowlands in terms of land-

scape, previously conducted landscape and forestry research (Figs. 1, 3, 4).

Using GIS technologies based on the landscape map of Pokut Carpathians (Hostiuk, Melnyk, 2017) information on the distribution of habitats of flora and fauna species listed in the Red Book of Ukraine (2009) (Didukh, 2009; Akimov, 2009), according to the Chronicle of Hutsulshchyna National Nature Park (2018, 2020), taxonomic description of Hutsulshchyna National Nature Park (2004) and functional own zoning maps (Fig. 1) (Brusak, Maidanskyi, 2006) and own field research. As a result of expeditions, the area of the common snowdrop, the living lunaria, the annual plaun, and the common nest were found in the area of regulated recreation. Among the animals found here there are the spotted salamander, yellow-bellied owl and long-tailed owl.

Based on the above-mentioned materials and research, some proposals were presented regarding the optimization of the functional zoning of Hutsulshchyna National Nature Park.

As the authors' proposals are based on a landscape approach, the boundaries of functional zones have been slightly changed, and carried out within the natural territorial complexes of a certain rank (landscapes, areas, streams, tracts), and not within neighborhoods and allotments according to forest management materials. According to the Law of Ukraine «On Nature Reserve Fund», the lands of the Nature Reserve Fund of Ukraine, in accordance with Article 6 of this Law are objects of comprehensive protection (On

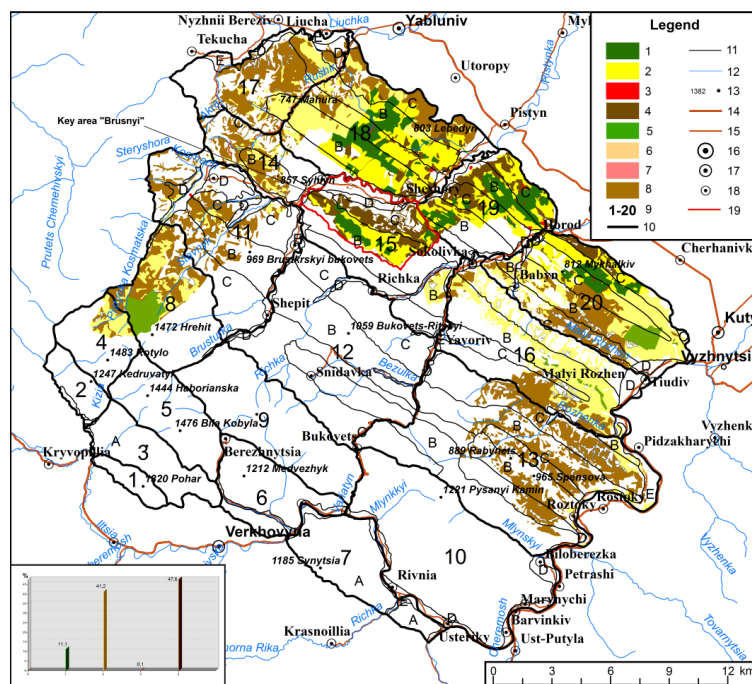


Fig. 1. Existing functional zoning Hutsulshchyna National Nature Park (Brusak, Maidanskyi, 2006)

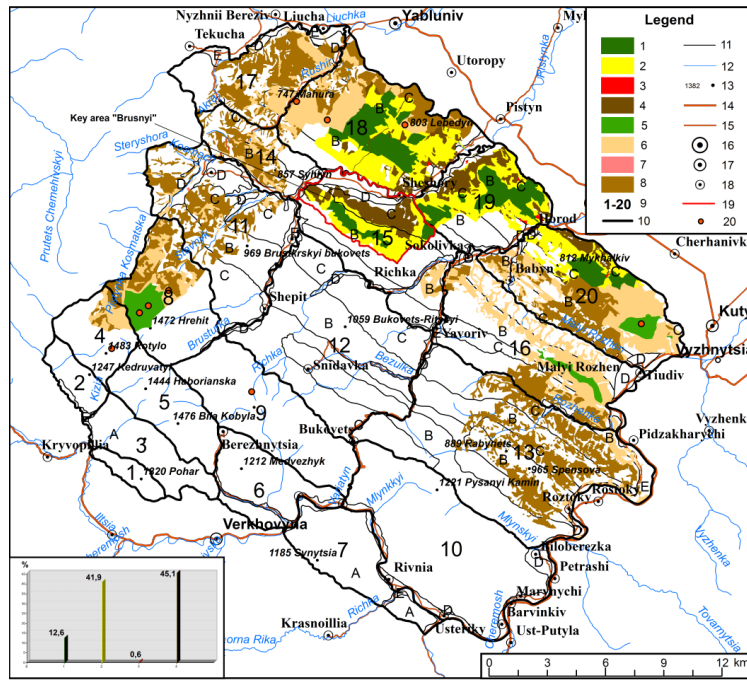


Fig. 2. Proposed functional zoning Hutsulshchyna National Nature Park

Legend to Figures 1 and 2

Functional zones of Hutsulshchyna National Nature Park (territories provided by Hutsulshchyna National Nature Park for permanent use): 1 – protected zone, 2 – regulated recreation zone, 3 – stationary recreational zone, 4 – economic zone; (territory of Hutsulshchyna National Nature Park without withdrawal from regular users): 5 – protected zone, 6 – regulated recreational zone, 7 – stationary recreational zone, 8 – economic zone; 9 – landscape indices (1 – Poharskyi, 2 – Kedruvatyi, 3 – Vipchynskyi, 4 – Rotylskyi, 5 – Bilokobylskyi, 6 – Vedmezhyskyi, 7 – Sinitysynskyi, 8 – Hrehitskyi, 9 – Ihretskyi, 10 – Pysanokaminskyi, 11 – Brustursko-Bukovetskyi, 12 – Bukovets-Ritskyi, 13 – Spensovyi, 14 – Sihlinskyi, 15 – Brusnyi, 16 – Sokilskyi, 17 – Mahuro-Pokutskyi, 18 – Karmaturskyi, 19 – Kamenystyi, 20 – Khomynskyi); 10 – boundaries of landscapes; 11 – boundaries of localities (A – steeply eroded-denudation wooded middle mountains, B – steeply eroded-denudated wooded lowlands, C – sloping erosive denudation wooded lowlands, D – high terraced slopes of the river valleys, E – terraced bottoms of river valleys); 12 – rivers; 13 – heights; 14 – roads of interregional significance, 15 – roads of local significance; 16 – cities; 17 – settlements; 18 – villages; 19 – the boundary of the key area; 20 – ancient forests.

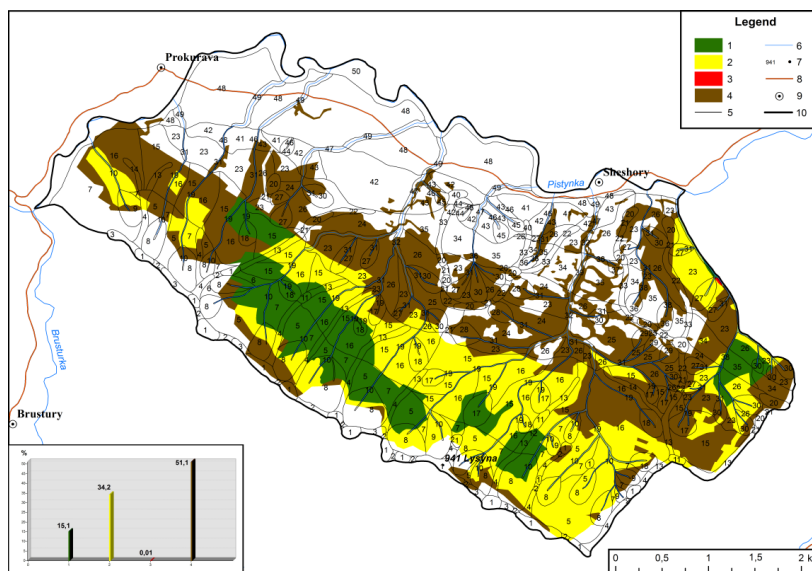


Fig. 3. Existing functional zoning of Hutsulshchyna National Nature Park on Brusnyi key area (Brusak, Maidanskyi, 2006).

Legend to Fig. 3.

Functional zones of Hutsulshchyna National Nature Park: 1 – protected zone, 2 – zone of regulated recreation, 3 – stationary recreation, 4 – economic zone; 5 – boundaries of landscape simple tracts (full names see in explanations); 6 – rivers; 7 – heights; 8 – roads of local significance; 9 – villages; 10 – the boundary of the key area.

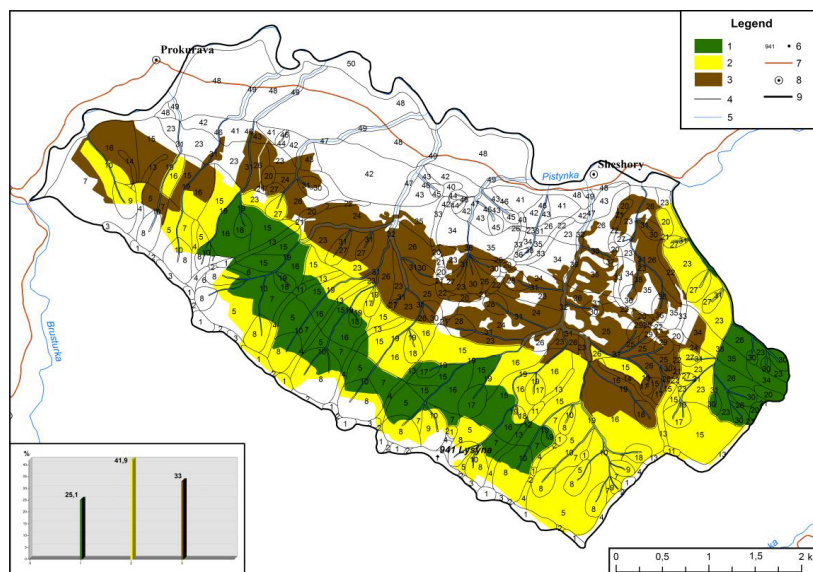


Fig. 4. Proposed functional zoning of Hutsulshchyna National Nature Park on Brusnyi key area

Legend to Fig. 4.

Functional zones of Hutsulshchyna National Nature Park: 1 – protected area, 2 – regulated recreation area, 3 – economic area; 4 – boundaries of landscape simple tracts (full names see in explanations); 5 – rivers; 6 – heights; 7 – roads of local significance; 8 – villages; 9 – the boundary of the key area.

Explanation to Fig. 3 and 4 (Hostiuk, Melnyk, 2018)

Ordinary tracts. 1. Dome-shaped peaks with secondary bent swampy oat meadows on sod-brown low-powerful low-rocky soils. 2. Saddles with secondary thyme oat meadows on sod-brown low-powerful strongly rocky soils. 3. Sloping areas of the combs of ridges with secondary thyme fire meadows on sod-brown low-powerful low-rocky soils. 4. Combs of steep spurs of the ridges of the north-eastern extension with secondary bent oat meadows on sod-brown low-powerful low-rocky soils. 5. Steep slopes of the north-eastern exposition with moist blueberry-blackberry beech-fir spruce on light brown mountain-forest low-power medium-rocky soils. 6. Steep slopes of the south-eastern exposition with moist blueberry-blackberry beech-fir spruce on light brown mountain-forest low-powerful high-rocky soils. 7. Steep slopes of the north-western exposition with blueberry-blackberry beech-fir spruce on light brown mountain-forest low-powerful high-rocky soils. 8. Water catchment funnels of the north-eastern and northern expositions with moist blueberry-blackberry beech-fir spruce on light brown mountain-forest low-power high-rocky soils. 9. Water collecting funnels of the north-western exposition with moist blueberry-blackberry beech-fir spruce on brown mountain-forest low-power high-rocky soils. 10. Places with moist sedgy fir spruce on brown mountain-forest soils. 11. Convex peaks with blueberry-blackberry spruce-fir beeches on brown mountain-forest medium-powerful, medium-rocky soils. 12. Saddles with blueberry-blackberry spruce-fir beeches on brown mountain-forest medium-powerful, medium-rocky soils. 13. Combs of steeply falling spurs of north-eastern ridges with moist blueberry-blackberry spruce-fir beeches on brown mountain-forest medium-powerful, medium-rocky soils. 14. Combs of steeply falling spurs of north-western ridges with moist blueberry-blackberry spruce-fir beeches on brown mountain-forest medium-powerful, medium-rocky soils. 15. Steep slopes of northeastern and northern expositions with moist blueberry-blackberry spruce-fir beeches on brown mountain-forest medium-powerful, medium-rocky soils. 16. Steep slopes of the north-western and western expositions with moist blueberry-blackberry spruce-fir beeches on brown mountain-forest medium-strong, medium-rocky soils. 17. Water collecting funnels of the north-eastern exposition with moist heather spruce-fir beeches on brown mountain-forest medium-powerful, medium-rocky soils. 18. Water collecting funnels of the north-western exposition with moist blueberry-blackberry spruce-fir beeches on brown mountain-forest medium-powerful, medium-rocky soils. 19. Places with moist sedgy-gear spruce-fir beeches on brown mountain-forest soils. 20. Convex peaks with secondary bent swampy oat meadows on sod-brown medium-powerful medium-rocky soils. 21. Saddles with secondary bent swampy oat meadows on sod-brown medium-powerful moderate-rocky soils. 22. Sloping areas of ridges with secondary bent swampy oat meadows on sod-brown earth medium-powerful moderate-rocky soils. 23. Strongly declined slopes of the north-eastern and northern expositions with moist blackberry spruce-fir beeches on brown mountain-forest medium-powerful, moderate-rocky soils. 24. Declining slopes of the south-eastern exposition with moist blackberry-blueberry spruce-fir beeches on brown mountain-forest medium-powerful moderate-rocky soils. 25. Strongly declined slopes of the south-western exposition with moist blackberry-blueberry spruce-fir beeches on brown mountain-forest medium-powerful medium-rocky soils. 26. Strongly declined slopes of the north-western and western expositions with moist blackberry-blueberry spruce-fir beeches on brown mountain-forest medium-powerful, moderate-rocky soils. 27. Water collecting funnels of the north-eastern exposition with moist heather spruce-fir beeches on brown mountain-forest medium-powerful moderate -rocky soils. 28. Water collecting funnels of the south-eastern exposition with moist heather spruce-fir beeches on brown mountain-forest medium-powerful moderate -rocky soils. 29. Water collecting funnels of the south-western exposition with moist heather spruce-fir beeches on brown mountain-forest medium-powerful moderate -rocky soils. 30. Water collecting funnels of the north-western exposition with moist wire spruce-fir beeches on brown mountain-forest medium-powerful moderate -rocky soils. 31. Places with moist heather spruce-fir beeches on brown mountain-forest soils. 32. The bottoms

of streams with raw fir white-stone spruce-fir beeches on brown mountain-forest-powerful weak-rocky soils. 33. Strongly sloping areas of ridges of northeastern ridges with secondary bent swampy oat meadows on sod-brown earth-powerful weak-rocky soils. 34. Strongly sloping slopes of the north-eastern exposition with moist blackberry fir beeches on dark brown mountain-forest-powerful weak-rocky soils. 35. Strongly declined slopes of the north-western exposition with moist blackberry fir beeches on dark brown mountain-forest-powerful weak-rocky soils. 36. Water collecting funnels of the north-eastern exposition with moist bent swampy oat meadows on sod-brown earth-powerful weak-rocky soils. 37. Water collecting funnels of the north-western exposition with moist bent swampy oat meadows on sod-brown earth strong weak-rocky soils. 38. Places with moist berry gray alder on brown mountain-forest soils. 39. The bottoms of streams with raw fir white-stone gray alder on sod-brown earth powerful weak-rocky soils. 40. Convex surfaces of high terraces with bent swampy oat meadows on sod-brown earth-powerful low-rocky soils. 41. Sloping slopes of high terraces of the northern exposition with bent swampy oat meadows on sod-brown earth-powerful low-rocky soils. 42. Sloping slopes of high terraces of the north-eastern exposition with bent swampy oat meadows on sod-brown earth-powerful low-rocky soils. 43. Sloping slopes of high terraces of the north-western exposition with bent swampy oat meadows on sod-brown earth-powerful low-rocky soils. 44. Water collecting funnels of the north-eastern exposition with moist letter meadows on sod-brown earth-powerful low-rocky soils. 45. Water collecting funnels of the north-western exposition with moist letter meadows on sod-brown earth-powerful low-rocky soils. 46. Places with raw beeches-gray alder on sod-brown soils. 47. The bottoms of streams with raw fir-letter-white-stone gray alder on sod-brown soils. 48. Sloping surfaces of middle and low terraces with raw puddle-white-stone gray alder on sod-brown soils. 49. The bottoms of small streams are made of gravel and pebbles with gray alder on sod-brown soils. 50. Floodplains of the year are composed of gravel and pebbles with raw gray alder on alluvial-meadow soils.

* Modern vegetation is given in the names of tracts.

the nature reserve fund of Ukraine: Law of Ukraine, 2019). Therefore, the boundaries of functional zones must correspond to the boundaries of natural-territorial complexes for the full protection of the natural environment, as the protection of one component of nature will not ensure the protection and preservation of the entire natural complex.

The ratio of functional zones was also slightly changed. According to the requirements of the International Union for Conservation of Nature IUCN, the protected area and the area of regulated recreation must occupy at least 75% of the protected area (Categories, objectives and criteria for protected areas, 1978). Instead, the total protected area in the park is 7.7% of the territory, regulated recreation is 41.2%, while more than half of the park is occupied by the economic zone – 50.7% (Prorochuk, Stefurak, Brusak, Derzhypil'skyi, 2013). In the Pokut Carpathians, the protected area is 11.1%, regulated recreation – 41.2%, economic – 47.6% (Fig. 1).

The geographical location of the functional areas has also been slightly adjusted, as according to the IUCN Chronicle Program for National Parks, the functional areas should be located in concentric circles, where the central part should be a protected area, then regulated recreation and then economic (Categories, objectives and criteria for protected areas, 1978). It is not recommended that the protected area be adjacent to the economic zone (Adrienko et al., 2002). To maintain the compactness of the zone, it can include other partially modified or long-term derived ecosystems in small areas of scientific or ecological stabilizing value (Andriienko, Popovych, Parchuk, 2002).

In addition, small areas of forests within the terraced bottom of the Pistynka River Valley, on the key

section «Brusny», in our opinion, should not be provided to the park for permanent use, as they have no scientific or recreational value and located within the settlement between building.

Proposing changes to the functional zoning, the key area of Brusnyi is as follows: the authors have included tracts of steep northeastern and northwestern slopes, combs of steep spurs of the ridge, the lower part of the catchments of the northeastern exposition to the protected area. (for the full name of the tracts, see explanation to (Fig. 3, 4). These are tracts that in the previous zoning partly belonged to the protected area, tracts that were located in the upper part of the slope, tracts where Red Book plants and valuable plant groups were found. The zone of regulated recreation includes the tracts of the upper parts of the catchment funnels of the north-eastern exposition and water catchment funnels of the same exposition, steep slopes of the north-eastern and north-western exposures, combs of steep spurs of the northeastern ridge. (Fig. 3, 4). In addition to those allotments that have already been assigned to the zone of regulated recreation, we have included allotments with adjusted boundaries, which were in the economic zone in the upper parts of the slopes and which bordered on the protected area. The economic zone was slightly changed due to its transfer to the zone of regulated recreation in the areas of the upper parts of the slope and the areas bordering the protected area. Tracts of catchment funnels of different exposures, steep and declining slopes of the north-eastern and north-western exposures, bottoms of streams remained the economic zone (for the full name of the tracts see the explanation in Figs. 3, 4). All tracts of this zone are located in the middle and

lower part of the north-eastern slope of the Brusnyi ridge.

As a result of research it was found that some landscape tracts belonged to two or even three different functional zones, which is not acceptable according to the landscape approach and integrated protection, so we tried to refer these tracts to one zone even if a part of the tract used to be under an anthropogenic impact. Similarly, some tracts have been assigned to the zone of regulated recreation. The boundaries of the economic zone, as far as possible, it was proposed to change the boundaries of natural complexes, but without significant increasing of its area. Valuable forests or other objects are not always available in the tracts that are partially or completely included in the protected area, but they are included in the protected area for the purpose of comprehensiveness and full protection because there may be both ancient and young forests in one tract due to anthropogenic intervention. Thus, the tracts in which partial anthropogenic activity is recorded are assigned to the protected area in order to preserve the whole natural complex, such as one slope.

Analyzing the spatial location of functional zones after the proposals for changes in the functional zoning of Hutsulshchyna NNP, it can be noted that the

functional zones are located in concentric circles, where the core is a protected area surrounded by a regulated recreation area and only then located economic zone (Fig. 4).

Some clarifications of the boundaries of functional zones were made in other areas of the park, mainly where there is a protected area, the boundary of which does not correspond to the boundaries of natural territorial complexes – in particular the massif near Hrehit Mount, Karmatura, Kamenisty, Khomynskyi and Sokilskyi ridges. Also, there were identified ancient forests (Fig. 2) that have scientific value, but according to functional zoning do not belong to the protected area. To change the functional zoning in areas that are not removed from other land users requires their consent, which will be extremely difficult to obtain, because the protected area is the absence of any economic measures. Analyzing the activities of Hutsulshchyna NNP and other land users in particular, SE «Kutsk Forestry» proposed to transfer these forests to the permanent use of Hutsulshchyna NNP.

Thus, after the optimization of the functional zoning of the territory of NPP «Hutsulshchyna» both in the key area and in the whole territory, the distribution of functional zones has changed slightly (Fig. 2, 4, Table 1).

Table 1. Area and ratio of functional zones on the territory of Hutsulshchyna National Park within Pokut Carpathians

Name of functional zones	Brusnyi key area				Territory given to Hutsulshchyna National Park for permanent use				Entire territory of Hutsulshchyna NNP			
	Modern division of zones		Proposed		Modern division of zones		Proposed		Modern division of zones		Proposed	
	Area, km ²	%	Area, km ²	%	Area, km ²	%	Area, km ²	%	Area, km ²	%	Area, km ²	%
Reserved	1.7	15.1	2.8	25.1	15.5	25.7	19.3	32.0	20.9	11.1	23.6	12.6
Regulated recreation	3.9	34.2	4.7	41.9	27.5	45.6	27.3	45.3	77.3	41.2	76.9	41.9
Stationary recreation	0.002	0.01	-	-	0.2	0.3	0.2	0.3	0.22	0.1	1.3	0.6
Economical	5.5	51.1	3.7	33.0	16.9	28.4	13.3	22.4	89.2	47.6	85.6	45.1
Total	11.2	100	11.2	100	60.2	100	60.2	100	187.6	100	187.6	100

In our opinion, the proposed scheme of functional zoning is more optimal for this area, as the zoning uses a landscape approach, the available landscape map at the level of localities, structures and simple tracts, and takes into account the boundaries of natural territorial complexes. The advantage of the proposed zoning is the complexity, which allows to protect fully and use rationally the natural territorial complexes of Pokut Carpathians.

Conclusions.

Taking into account the main problems of Hutsulshchyna NNP – non-landscape creation, high clustering, low percentage of land provided to the park for permanent use, the presence of several (three) forest users in the park, created functional zoning not a landscape approach, we optimized the existing functional zoning. Proposals to change the functional zoning of

the park were submitted in accordance with the Law of Ukraine «On Nature Reserve Fund» and «Program of the Chronicle of Nature for National Parks of Ukraine». For the first time on the basis of a landscape map in the scale of 1:25 000 at the level of simple tracts, proposals were submitted to improve the existing functional zoning of the territory of Hutsulshchyna NNP. The proposed zoning based on the landscape approach should influence effectively the protection

of landscape complexes, the activities of Hutsulshchyna NNP, as the creation of a national park involves comprehensive protection of natural areas, rather than its individual components. Optimization of functional zoning of Hutsulshchyna National Park will increase the degree of protection of different landscapes in topological terms, as there are both low-mountain and medium-mountain types of landscapes in the studied area.

References

- Akimov, I.A. (Ed.) (2009). Chervona knyha Ukrainy. Fauna [Red Book of Ukraine. Fauna]. Kyiv. Hlobalkonsal'tynh (In Ukrainian).
- Andriienko, T. L., Popovych, S. Yu., Parchuk, H. V. (2002). Prohrama Litopysu pryrody dlia zapovidnykiv ta natsionalnykh parkiv [Chronicle of Nature program for reserves and national parks]. Kyiv. (In Ukrainian).
- Brusak, V.P., Maidanskyi, M. A. (2006). Funktsionalne zonuvannya terytorii Natsionalnoho pryrodnoho parku «Hutsulshchyna» [The functional zoning of the territory National Nature Park «Hutsulshchyna»]. Lviv. (In Ukrainian).
- Brusak, V.P., Zinko, Yu.V. (2011). Priorytety funktsionuvannya natsionalnoho pryrodnoho parku «Hutsulshchyna» [Priorities of Hutsulshchyna National Nature Park functioning]. Kyiv, 138-142 (In Ukrainian).
- Brusak, V.P., Maidanskyi, M. A. (2013). Funktsionalne zonuvannya natsionalnykh parkiv ta rehionalnykh landshaftnykh parkiv Karpatskoho rehionu: suchasnyi stan, metody i metodolohiia realizatsii. [Functional zoning of national parks and regional landscape parks of the Carpathian region: current state, methods and methodology of implementation]. Visnyk of the Lviv University. Series Geography. Lviv. 41, 50–69. (In Ukrainian).
- Burianyk, O. O. (2019). Ekoloho-landshaftoznavchyi analiz Skolivskykh Beskyd [Ecological and landscape analysis of the Skole Beskids]. (Candidate's thesis). Taras Shevchenko National University of Kyiv. Kyiv. (In Ukrainian).
- «Hutsulshchyna» National Nature Park. (2018). Litopys pryrody NPP «Hutsulshchyna» [Chronicle of nature «Hutsulshchyna» National Nature Park] (Vol. 15). Kosiv [In Ukrainian].
- «Hutsulshchyna» National Nature Park, 2020. Litopys pryrody NPP «Hutsulshchyna» [Chronicle of nature «Hutsulshchyna» National Nature Park] (Vol. 17). Kosiv [In Ukrainian].
- «Hutsulshchyna» National Nature Park. (2004). Taksatsiynyi opys Sheshorskoho pryrodokhoronnoho naukovo-doslidnoho viddilennia [Taxonomic description of Sheshorsky nature protection research department «Hutsulshchyna» National Nature Park] Lviv [In Ukrainian].
- Categories, objectives and criteria for protected areas. (1978). A Final Report prepared by Com. on Criteria and Nomenclature. Com. on National Parks and Protected Areas (IUCN). Morges. 26 (In Switzerland)
- Didukh, Ya. P. (Ed.). (2009). Chervona knyha Ukrainy. Flora [Red Book of Ukraine. Flora]. Kyiv. Hlobalkonsal'tynh (In Ukrainian).
- Gostiuk, Z. V., Melnyk, A. V. (2018). Osoblyvosti landshaftnoi dyferentsiatsii lisopatolohichnykh protsesiv v Sheshorskomu pryrodokhoronomu naukovo-doslidnomu viddilenni Natsionalnoho pryrodnoho parku «Hutsulshchyna» [Features of landscape and forest pathology processes differentiation in the Sheshory natural scientific research department («Hutsulshchyna» National park)]. Geology, Geography, Ecology. 49. 178-189. DOI: <https://doi.org/10.26565/2410-7360-2018-49-14>. (In Ukrainian).
- Gostiuk, Z. V., Melnyk, A. V. (2017). Landshaftna struktura Pokutskykh Karpat [Landscape structure of the Pokuttya Carpathians]. Physical geography and geomorphology. 3 (87). 38-47. (In Ukrainian).
- Hul, T., Senchyna, B., Khomyn, B. (2005). Problema staloho funktsionuvannya natsionalnykh parkiv Karpatskoho rehionu [The problem of sustainable functioning of national parks in the Carpathians region]. Visnyk of the Lviv University. Series Geography. 32. 155–162 (In Ukrainian).
- Kukurudza, M.M. (Elbakidze M.M.). (2003). Menedzhment natsionalnykh parkiv [Management of national parks]. Lviv. (In Ukrainian).
- Miller, G. P., 1996. Polove landshaftne znimannya hirskykh terytorii [Field landscaping of mountainous areas]. Kiev: IZMN (In Ukrainian).
- Natsionalni pryrodni parky Ukrainy. (2020). [National natural parks of Ukraine]. <https://www.nationalparks.in.ua/pryrodni-parky/> (In Ukrainian).
- Pro pryrodno-zapovidnyi fond Ukrainy. (2019). [On the nature reserve fund of Ukraine: Law of Ukraine]. Information of the Verkhovna Rada of Ukraine. 34. 502 (In Ukrainian).
- Prorochuk, V. V., Stefurak, Yu. P., Brusak, V. P., Derzhypil'skyi, L.M. (Eds.). (2013). Natsionalnyi pryrodnyi park «Hutsulshchyna» [National Nature Park «Hutsulshchyna»]. Lviv. NVF «Karty i Atlasy» (In Ukrainian).

- «Hutsulshchyna» National Nature Park (2009). Proekt orhanizatsii terytorii Natsionalnoho pryrodnoho parku «Hutsulshchyna», okhorony, vidtvorennia ta rekreatsiinoho vykorystannia yoho pryrodnykh kompleksiv ta obiektiv [Project of organization of the territory of the National Natural Park «Hutsulshchyna», protection, reproduction and recreational use of its natural complexes and objects]. Vol. 2, Lviv. (In Ukrainian).
- Splodytel, A.O. (2018). Landshaftoznavche obgruntuvannia optymizatsii diialnosti Natsionalnykh pryrodnykh parkiv Ukrainy (na prykladi natsionalnykh pryrodnykh parkiv «Nyzhnosulskyi» ta «Oleshkivski pisky») [Landscape science substantiation of optimizing the activity of the national nature parks of Ukraine (on the example of the national nature parks («Nyzhnosulskyi» and «Oleshkivski pisky»)]. (Candidate's thesis). Odesa State Ecological University. Odesa. (In Ukrainian).