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LANDSCAPE REPRESENTATIVENESS OF THE TRANSCARPATHIAN REGION OF UKRAINE

Karabiniuk M.M. **Landscape representativeness of the Transcarpathian region of Ukraine.**

The results of the modern landscape structure analysis of the Transcarpathian region territory, which is integrally confined to the southwestern macroslope of the Ukrainian Carpathians, are presented. The study of the peculiarities of the territory landscape organization was carried out at the regional level mainly on the basis of the analysis of previously published cartographic materials and the results of own field research in the upper reaches of the Tisza River basin. Cartographic materials by A. Melnyk (1999) were processed in the ArcGIS software environment and a landscape map of the Transcarpathian region was compiled, taking into account field surveys of the subalpine and alpine highlands of Chornohora. The modern landscape structure of the studied territory is formed by 12 altitude terrains of different origins and properties. The largest among them in terms of area is the high-altitude area of the steeply sloping erosion-denudation forested middle highlands, which occupies more than 3,302 km² within the region. We also paid special attention in the study to the peculiarities of the vertical landscape differentiation of the Transcarpathian region mountainous part, a significant part of which is covered by the Ukrainian Carpathians. The article describes the characteristic features of the highland, midland and lowland landscape tiers of the Ukrainian Carpathians, which are closely related functionally and evolutionarily.

Keywords: natural territorial complex, landscape, physical-geographical unit, landscape tier, landscape structure, Transcarpathian region, Ukrainian Carpathians.

Карабінюк М.М. **Ландшафтна репрезентативність Закарпатської області України.** – Природа Карпат: науковий щорічник Карпатського біосферного заповідника та Інституту екології Карпат НАН України. – 2023. – №1 (8). – С. 79–90.

Представлені результати аналізу сучасної ландшафтної структури території Закарпатської області, яка цілісно приурочена до південно-західного макросхилу Українських Карпат. Вивчення особливостей ландшафтної організації території проводили на регіональному рівні головно на основі аналізу раніше опублікованих картографічних матеріалів та результатів власних польових досліджень у верхів'ї басейну річки Тиса. У програмному середовищі ArcGIS опрацьовано картографічні матеріали А.В. Мельника (1999) та укладено ландшафтну карту Закарпатської області з врахуванням натурних польових обстежень висотних місцевостей субальпійського й альпійського високогір'я Чорногори. Сучасну ландшафтну структуру досліджуваної території формують 12 висотних місцевостей різного походження та властивостей. Найбільшою серед них за площею є висотна місцевість крутосхилого ерозійно-денудаційного лісистого середньогір'я, яка в межах області займає понад 3 302 км². Також особливу увагу в дослідженні ми приділили особливостям вертикальної ландшафтної диференціації гірської частини Закарпатської області, значну частку якої охоплюють Українські Карпати. У статті описано характерні ознаки високогірного, середньогірного та низькогірного ландшафтних ярусів Українських Карпат, які тісно пов'язані між собою функціонально та еволюційно.

Ключові слова: природний територіальний комплекс, ландшафт, фізико-географічна одиниця, ландшафтний ярус, ландшафтна структура, Закарпатська область, Українські Карпати.

Topicality of research

The interaction and relationship of natural components (rocks, air masses, water, vegetation, etc.) lead to the formation of integral natural units on the earth's surface, which in geographical science are called natural territorial complexes (landscape complexes, geocomplexes) (Herenchuk, 1968; Melnyk, 1999; Grodzynskyi, 2005; Karabiniuk, 2020). Their functioning and development mainly depends on internal and external factors, among which climatic conditions and anthropogenic influences play an important role today.

Transcarpathian region territory is integrally confined to the southwestern macroslope of the Ukrainian Carpathians and is characterized by exceptional natural conditions – the dominance of windward and insolationally warmer southwestern slopes, the dominance of warm and moist Atlantic air masses, the formation of a complete hydrological network of the Tisza River, etc. A characteristic feature of the studied area is also a combination of landscapes of different origins and with special morphological features. A significant part of them are unique and high value from the point of view of nature conservation, recreation, tourism and economy. The growth of anthropogenic load in the conditions of the deterioration of the geoecological situation in Ukraine and global climate changes require an urgent study of the landscape organization features of the Transcarpathian region for further analysis of the landscape diversity and the development of a strategy for preserving the natural environment in conditions of potential geoecological threats.

Materials and methods

Landscapes of Transcarpathian region and their morphological units have repeatedly been the objects of research now and in the past. A number of scientific works play an important role in determining the regularities of the formation and development of the landscape structure, the current state and functioning of the natural territorial complexes of the region. In particular, these are the works of K. Herenchuk (1968, 1981), G. Miller (1974), A. Marynych (1985), H. Miller and O. Fedirko (1990), H. Miller et al. (1997), A. Melnyk (1997, 1999), A. Melnyk et al., (2018), M. Karabiniuk (2019, 2020, 2021), Karabiniuk et al. (2022) and others.

Our studies of the landscape structure of the Transcarpathian region are mainly based on the analysis of a number of published landscape maps and the results of our own field research in the

mountainous part of the region. The analysis was based on the cartographic and analytical materials of A. Melnyk (1997, 1999). They largely summarize the currently available information about the regional organization and morphological structure of the Transcarpathian region landscapes, as well as their vertical differentiation, features of functioning, and other. With the help of modern geoinformation systems, the above-mentioned cartographic materials were vectorized in the ArcGIS software environment and a digital landscape map and a physical-geographical zoning map of the Transcarpathian region were developed. Based on them, a geospatial analysis of the landscape structure and the distribution of landscape complexes of various genesis within the region was carried out.

Outcomes and discussions

The landscapes of the mountainous part of the Transcarpathian region were formed mainly in the conditions of dominance in the geological basis of sandstone-argillite flysch, highly fragmented mountain relief and vertical differentiation of hydroclimatic conditions, which together determined the main morphological features of landscape complexes. The landscapes of the plain part of the region are characterized by accumulative and erosional origin, the development of which is closely related to the evolution of the Carpathian mountain system. As a result, more than 85% of the territory of the region is characterized by a mountainous terrain with a system of mountain massifs (Chornohora, Svidovets, Borzhava, etc.), steep ridges and their spurs, which are dissected and separated by deeply incised river valleys of the Tisza (fig. 1).

Landscapes of mountainous areas differ significantly from plains in the level and nature of landscape organization. Therefore, an important aspect of our research is the use of a genetic approach in the study of the modern state and development of the Transcarpathian region landscapes, which makes it possible to determine the spatial features of the formation and placement of geocomplexes of different genesis, as well as to analyze the modern landscape structure. In general, the landscape research approach involves the analysis of a continuous-discrete geographical envelope, through the prism of natural complexes of various ranks, which are directly located in a holistic landscape system, simultaneously uniting natural territorial complexes of smaller orders and being a constituent part of a landscape unit of a higher order (Melnyk, 1999; Grodzynskyi, 2005).

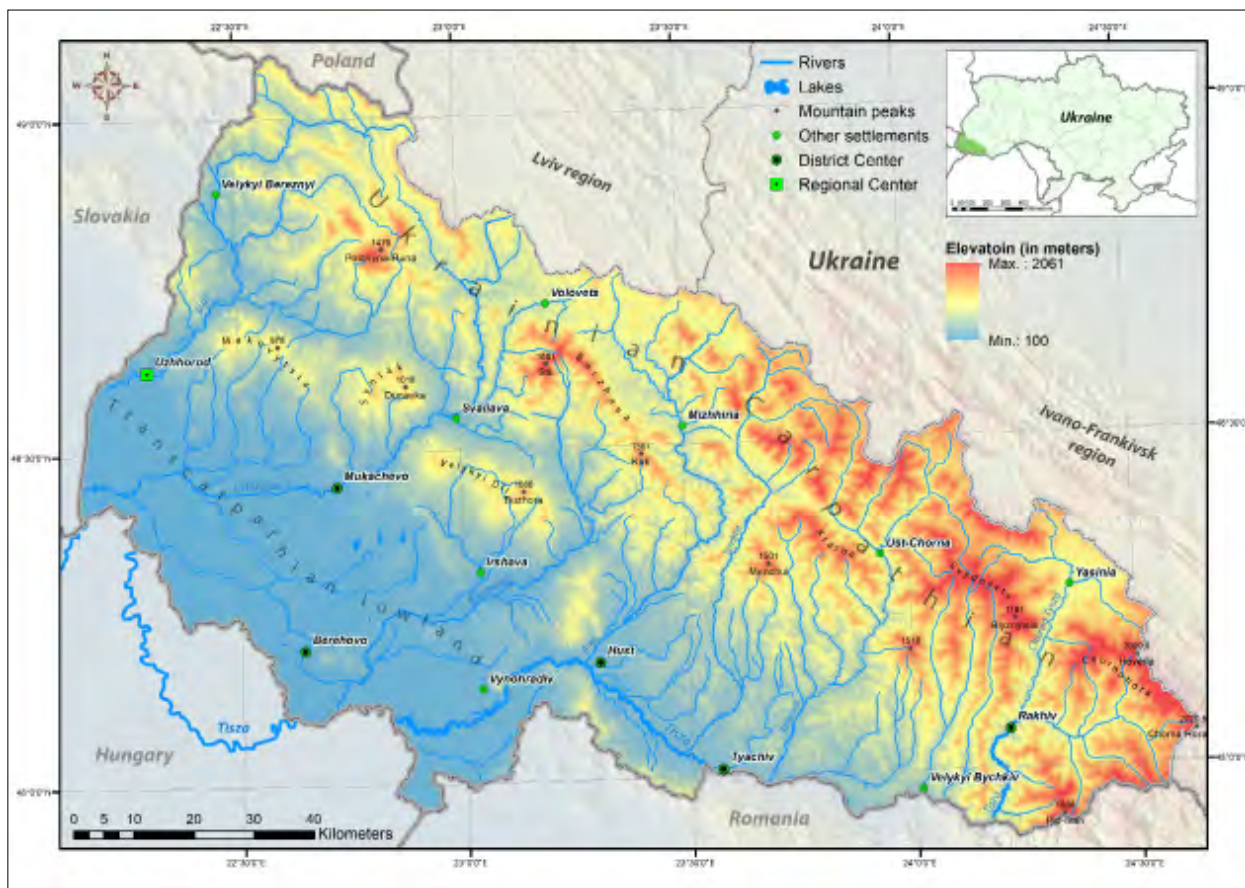


Fig. 1. Hypsometric map of Transcarpathian region (compiled by the author)

Current manifestations of global climate changes in the Ukrainian Carpathians have been repeatedly confirmed (Karabiniuk, Shuber, 2019; Karabiniuk, Markanych, 2020) and are relevant from the point of view of studying the landscape organization of the transboundary territory of the Transcarpathian region. Changes in climatic conditions affect all dynamic processes and functioning of landscape complexes, circulation of substances, development of physical and geographical processes, etc. One of the main manifestations of climate changes in mountainous regions is changes in the features of altitudinal belting and disruption of landscape tiering, which is one of the main geographical patterns of landscape differentiation of mountain systems (Karabiniuk, 2020).

Landscape tiering. The concepts of landscape tiering and landscape tier in geographical science don't have a clear interpretation and understanding. According to H. Miller et al. (2002) and M. Karabiniuk (2020), landscape tiering is manifested both at the regional and local levels. The essence of the regional level of mountain systems landscape tiering consists in the layered placement of mountain landscapes, their limitation to separate areas of a certain (low-

mountain, med-mountain, or high-mountain) tier of the mountain country, which are associated with the formation of physical-geographical or landscape areas in the mountains. At the local level, landscape tiering is manifested in the differentiation of landscapes into morphological units, in particular, altitude terrains that change with altitude and are characterized by significantly different properties (Karabiniuk, 2020).

The study of the vertical differentiation of the Ukrainian Carpathians and Transcarpathian region landscapes, in particular, testifies to the complex essence of landscape tiering, which expresses the height change of natural components and integral landscape complexes. Considering the complex features of the landscape tiering, it is clear that the differentiation of individual natural components (relief, vegetation, climate, etc.) and their height limits are not always correlated in different areas of the mountain system (Herenchuk, 1968, 1981). In the scientific literature, it is also noted that there are no clear height boundaries between landscape tiers, since they depend on a number of factors – the peculiarities of the geographical location and the complex of regional physical and geographical

features (Karabiniuk, 2020). For example, the distribution of nival and glacial-exarational forms of the relief – corries, cirques, glacial troughs, nival niches, etc. is also an identifying feature of the highlands landscape tier in the Ukrainian Carpathians (Kravchuk, 2006, 2008; Melnyk, Karabiniuk, 2018; Karabiniuk, 2020).

The regional understanding of the landscape tier is based on the study and analysis of the landscape organization of mountain systems and their regional division. Therefore, the landscape tier of the regional level is a separate landscape region, which is formed by a group of landscapes of the corresponding low-mountain, med-mountain, or high-mountain types (Karabiniuk, 2020). The hypsometric position and relative heights are considered the main criteria for determining whether landscapes belong to one or another landscape tier. According to H. Miller and O. Fedirko (1990), the foothills include landscapes with maximum relative elevations above river valleys of up to 150 m. For landscapes of the mid-mountain tier, this figure is up to 1 300 m. The highest relative elevations are characteristic of high-mountain landscapes – up to 1 500 m (Miller, Fedirko, 1990).

According to the landscape map of G. Miller and O. Fedyrko (1990), three landscape tiers are allocated in the Ukrainian Carpathians: high-mountain, med-mountain and low-mountain. Within the Transcarpathian region, at the hypsometrically highest levels, the landscapes of the high-mountain tier are located, which are represented by Ancient-glacial-high-poloninian flysch (Chornohora, Svidovets, etc.) and Ancient-glacial-high-poloninian crystalline (Marmarosh landscape) types. The largest mountainous part of the territory of Transcarpathia from the village of Veliky Berezny to Rakhiv is occupied by forested and steeply sloping landscapes of the mid-mountain tier, which stretch in strips from the northwest to the southeast. They are represented by Mid-mountain-poloninian and Mid-mountain-ancient-volcanic types. On the other hand, in the intermountain basins (Yasinyanska, Mizhhirska, etc.) and in the hilly foothills and lowland areas (Solotvynska plain, etc.), landscapes of low-mountain tier were formed, which are represented by three types: High-mountain, Low-mountain, and hill-valley (Miller, Fedirko, 1990).

On the basis of our (co-authored) research, it was established that in the Ukrainian Carpathians it is appropriate to distinguish two levels of landscape layers, the research and mapping of which is carried out at different scales and requires the use of

special methodological approaches. Landscape tiers of the regional level are distinguished within the entire mountain system. Within individual mountain landscapes, their morphological structure and properties of landscape complexes change with height, which causes a consistent change in landscape tiers at the local (intra-landscape) level (Karabiniuk, 2020). Thus, in the local sense, the mountain landscape tier within the landscape expresses the emergence of altitudinal differentiation of the morphological structure and properties of natural complexes of different genesis, features of functioning and development (Karabiniuk, 2020). The best expression of such an altitudinal change of landscape complexes is high terrains, which in mountain systems are located at different hypsometric levels depending on the manifestation of the leading factor of their formation – glacial exaration, denudation, erosion, etc.

Analyzing the features of natural features and the landscape structure of the mountainous part of Transcarpathian region, it is also possible to distinguish three landscape tiers at the local tier – low-mountain, medium-mountain and high-mountain (Fig. 2). They consistently change with increasing absolute height and are characterized by significant differences. The low-mountain landscape tier is characterized by the dominance of geocomplexes of erosive and accumulative origin, as it is limited to the bottoms of river valleys and extensive intermountain basins (Fig. 3). The undulating erosion relief and leveled surfaces of river valley terraces are covered mainly with secondary meadow vegetation with fragments of beech and spruce forests, alder and other deciduous species (Miller, Fedirko, 1990; Melnyk, 1999).

The mid-mountain landscape tier covers the largest area and height range of the mountainous area of Transcarpathian region and the Ukrainian Carpathians in general. It is represented by landscape complexes of mainly erosional and erosional-denudation origin, which are characterized by the predominance of steep slopes (over 15°) and dismembered spurs of mountain ridges with the dominance of coniferous, less often – deciduous forests on burozems (Cambisols) (Melnyk, 1999; Karabiniuk et al., 2017; Melnyk et al., 2018). On well-moistened slopes, erosion processes are actively developing under the influence of permanent and temporary watercourses, which diversify the morphological structure of the midland landscapes (Fig. 4).

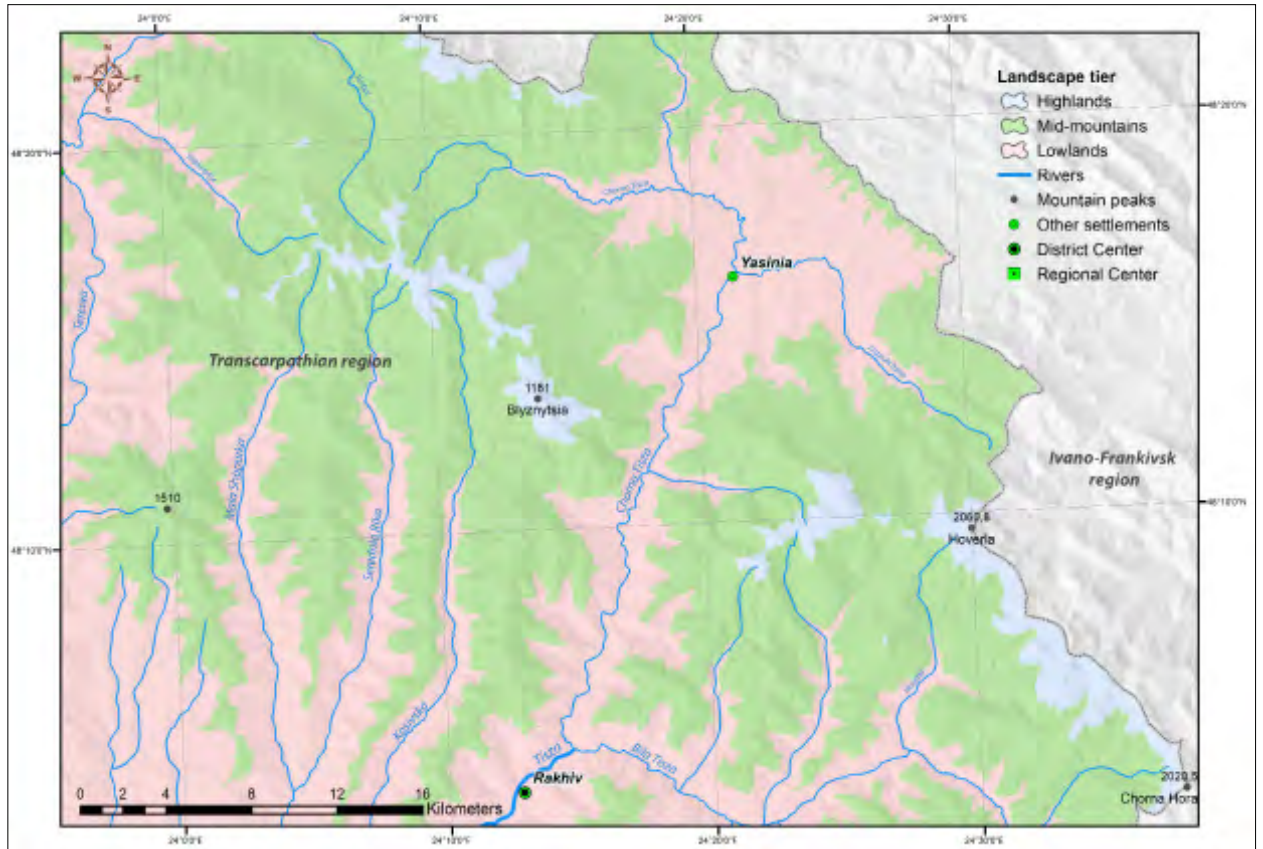
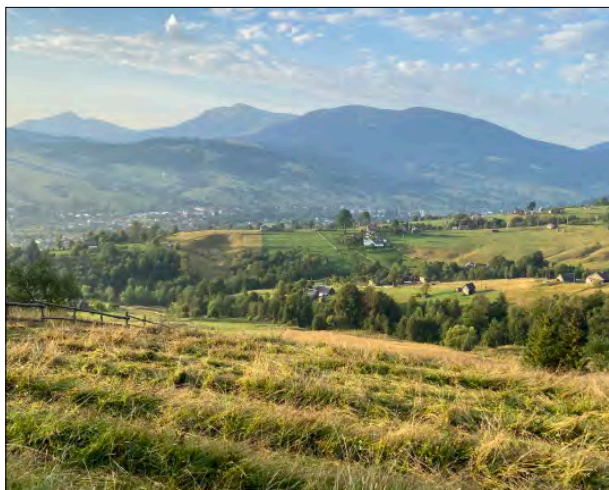


Fig. 2. Landscape tiers in the central part of the Ukrainian Carpathians in the upper reaches of the Tisza River basin (developed by the author)

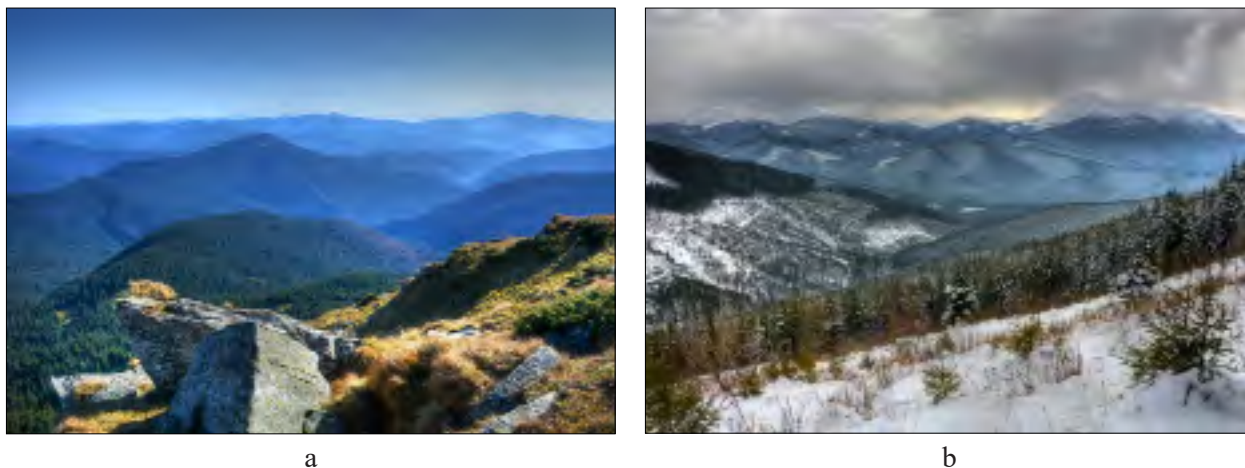


a



b

Fig. 3. The low-mountain landscape tier within the Yasinia Landscape in the summer (a) and winter (b) periods (photo by Yana Karabiniuk)



a

b

Fig. 4. Mid-mountain landscape tier of the Ukrainian Carpathians in the Rakhiv district of the Transcarpathian region in the summer (a) and winter (b) periods (photo by Vyacheslav Yagodzinsky)

The development of a dense river network and the deepening of erosion dismemberment in the mid-mountain landscape tier contribute to the general evolution of the landscape structure of the territory, which depends on the amount of precipitation and the petrographic and lithological features of the original sediments. As a result, the morphological structure and properties of the geocomplexes of the mid-mountain landscape tier in different parts of Transcarpathian region may differ significantly depending on the above-mentioned factors. A characteristic feature of the mid-mountain landscape layer is also significant anthropogenic load from economic activities, actively developing forestry and agriculture, in particular – plain farming (Fig. 5).

Hypsometrically, the highest levels of the Ukrainian Carpathians are mainly occupied by denudation, glacial-exarational and nival-erosion natural territorial complexes, which collectively form a high-mountain landscape tier (Fig. 6). In various mountain massifs (Chornohora, Svidovets, Marmaroskyi, etc.), the lower limit of the landscape tier varies between 1 450–1 600 m a.s.l. and often coincides with the contacts of the geological world. For example, within the Chornohora Landscape, in various sections, the lower limit of the highlands coincides with the contacts of the Chornohora and Yalovetsk (Burkut and Yalovetsk) geological stratum, the lithological and petrographic differences of which also cause a sharp contrast in the forms of the relief and their morphometric features (steepness of the slopes, exposure of the slopes etc.) (Miller, 1963; Karabiniuk et al., 2017; Melnyk, Karabiniuk, 2018)

A characteristic feature of the high-altitude landscape tier of the Ukrainian Carpathians is the

dominance of massive landforms with steep slopes and deeply incised glacial cirques, corries, nival niches and other geocomplexes. The landscape structure of the highlands acquired its modern features during the ancient Pleistocene glaciations, and the modern development of landscape complexes occurs mainly under the influence of erosion and denudation (Karabiniuk, 2020). Subalpine and alpine vegetation is most common in the highlands. The bottoms of corries, glacial troughs and the lower parts of massive slopes are covered with crooked forests of mountain pine (*Pinus mugo* Turra), junipers (*Juniperus sibirica* Burgsd.) and green alder (*Alnus viridis* (Chaix) DC.). In the subalpine vegetation zone, there are also admixtures of spruce (*Picea abies* (L.)), which are sporadically distributed among continuous thickets of shrubs (Baitsar, 1994; Malynovskyi, 1980, 2003). At altitudes above 1 850 m above sea level widespread alpine meadow vegetation.

In the Ukrainian Carpathians, the high-altitude landscape tier is best expressed at the highest hypsometric levels of the Chornohora, Svidovets, Marmarosh and Borzhava mountain landscapes. The dominance of hard sandstones in the geological base and the long history of the development of the high mountain range under the influence of intensive mountain formation, glaciations and modern climate changes caused a high landscape diversity (Karabiniuk, 2020). The convex and exposed surfaces of the crests of the main ridges of the high mountain massifs preserve the features of ancient denudation. On the steep slopes of the high-altitude landscape tier, rockfalls and screes processes are quite common, avalanches are recorded annually and manifestations of other physical and geographical processes.



Fig. 5. The burden of forestry (cutting) on the landscape complexes of the upper basin of the Chorna Tisza River in the Rakhiv district of the Transcarpathian region (fragment of a space image from Google Earth)

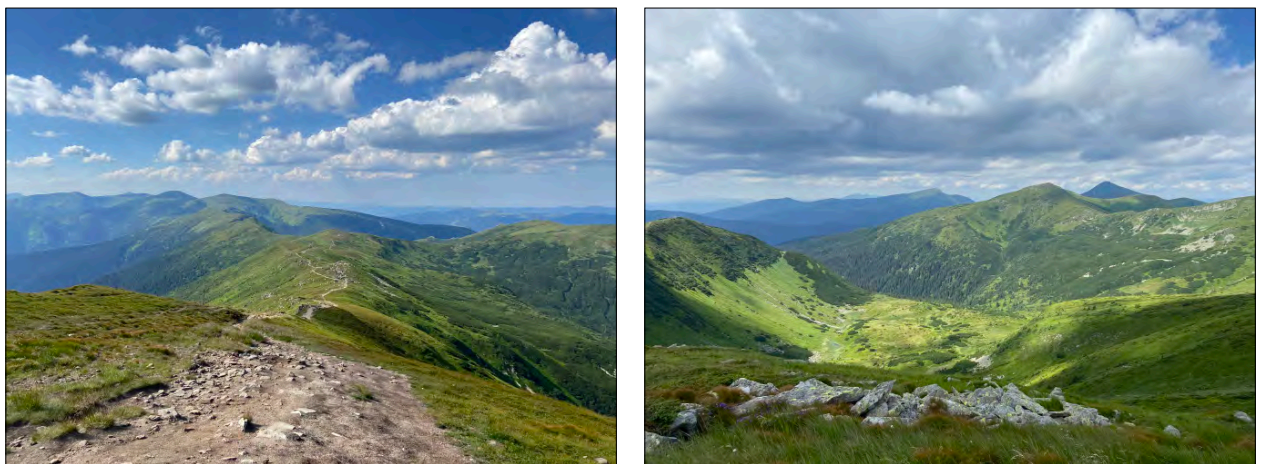


Fig. 6. High-mountain landscape tier within the landscape of Chornohora in the summer (author's photo)

Modern landscape structure. Under the action of zonal and azonal factors, a significant number of geocomplexes of various ranks and sizes, of different genesis and complexity of internal organization, formed on the earth's surface, forming a clear hierarchical structure, from the smallest landscape unit of the local level (facies) to the largest PTK of the global order (geographic shell). Landscapes occupy a special place in this hierarchical system. The landscape approach involves the study of the object taking into account its location in this landscape system and the properties of the internal structure (Melnik, 1999).

Each landscape complex at the local level is a

clearly defined element of the internal structure of the landscape, which was formed historically and separated primarily in the processes of development of the lithogenic (geological-geomorphological) base, and now is connected to each other by numerous functional and energy connections (Miller, Fedirko, 1990; Miller et al., 2002). Such a system of internal organization of the landscape subordinated to functional quantitatively determined connections, which is represented by a set of geocomplexes of lower ranks, that is, they are its morphological parts, with a peculiar character of spatial combination determined mainly in the process of historical development, is called a

morphological structure (Melnyk, 1999; Karabiniuk, 2020). Analyzing the landscape organization of any territory, the boundaries of which do not coincide with the boundaries of landscapes as the lowest unit of physical and geographic zoning, it is appropriate to use the term landscape structure.

According to the physical-geographical zoning of the Ukrainian Carpathians by A. Melnyk (1999), the territory of the Transcarpathian region is divided between the Mountain Carpathian Land and Transcarpathian Land (Fig. 7). The first of them occupies more than 85% of the area of the region and is represented by 8 physical-geographical regions, which stretch mainly from the northwest to the southeast in the form of strips of various configurations and widths from 5-10 to 30-35 km, repeating the direction of the main mountain ranges of different genesis and geological structure. Each of the physical and geographical areas is characterized by unique lithological features and internal structure, which is constantly developing

and transforming under conditions of climate change and sharp economic load. The transversal dismemberment of physical and geographical areas by river valleys is due to the presence of a significant number of tectonic disturbances, which were formed in the process of geological development of the territory and serve as the location of the largest river valleys. Also, a number of river valleys (the Chorna Tisza River, the Teresva River, the Rika River, etc.) serve as boundaries between physical and geographical regions that were formed on lower-order morphostructures and are morphologically different from each other.

According to the landscape map authored by A. Melnyk (1999) and own field research (Karabiniuk, 2020), the modern landscape structure of the Transcarpathian region is formed by 12 altitude terrains of different origins and with significantly different properties (Fig. 8). Hypsometrically, the highest and oldest altitude terrain is the convex denudation alpine-subalpine highland (1), which

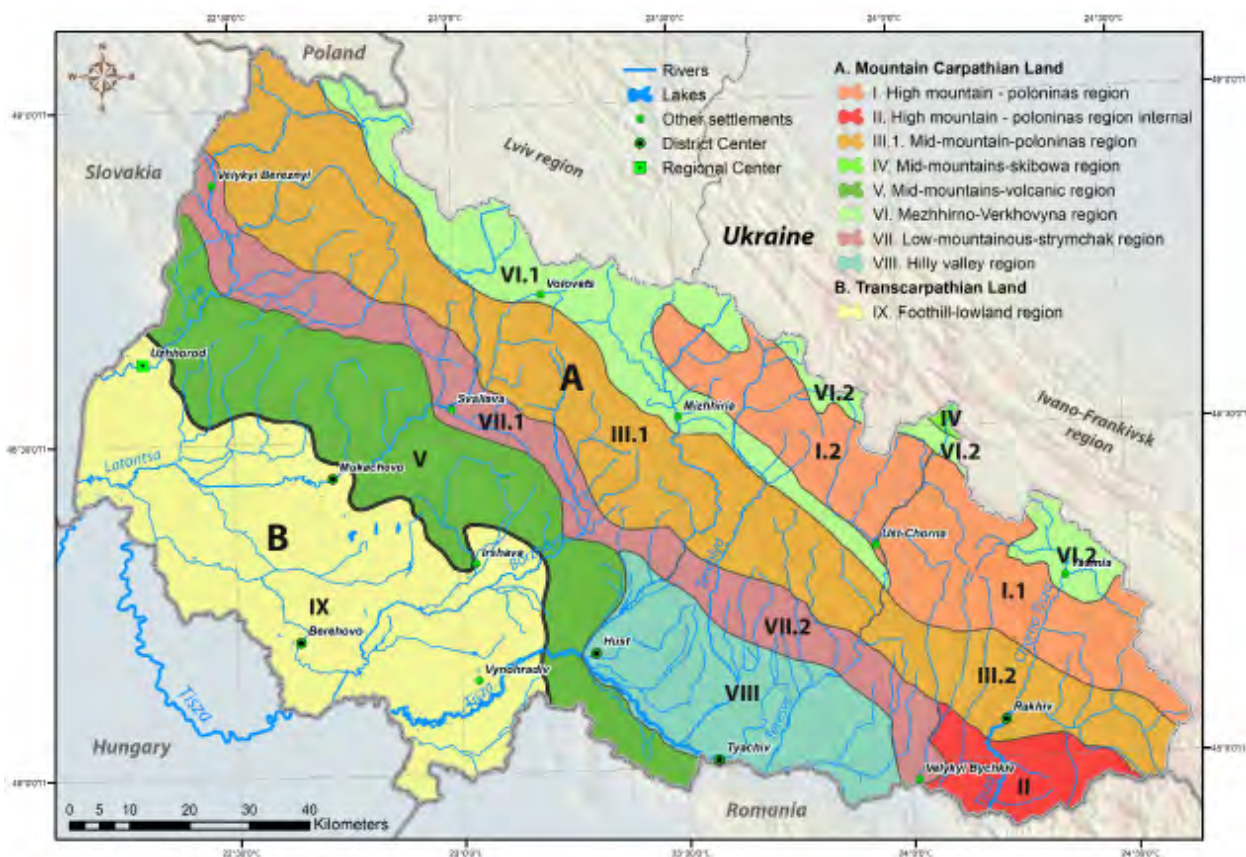


Fig. 7. Physical-geographical zoning of Transcarpathian region (compiled based on the materials of A. Melnyk, 1999) (A. Mountain Carpathian Land. I. High mountain-poloninas region. I.1. Svidovets-Chornohora area; I.2. Negorovets-Bushtulsky area. II. High mountain-poloninas region internal. Rakhiv-Chivchynu area. III. Mid-mountain-poloninas region. III.1. Polonyn ridge area; III.2. Stih-Play area. IV. Mid-mountain-skibova region. Gorgany area. VI. Mid-mountain-volcanic region. VI. Mezhhirno-Verkhovyna region. VI.1. Mizhhiria area; VI.2. Mizhhiria-valley area; VII. Low-mountainous-strymchac region. VII.1. Turyan area; VII.2. Uholka area. VIII. Hilly valley region. Solotvyno area. B. Transcarpathian Land. IX. Foothill-lowland region. Prytysyan lowland area.)

preserves relict traces of early denudation and today covers the exposed surfaces of the highest mountain massifs – Chornohora, Svidovets, etc. Powerful Pleistocene glaciations in the Ukrainian Carpathians led to the formation of the high terrain of the old-glacial subalpine highlands (2), which is represented by powerful corries, cirques, glacial troughs and other tracts with peculiar morphometric features. Both highland areas are located at altitudes above 1 450 m a.s.l. and are unique in the landscape structure of the terrain.

The territory of Transcarpathian region is also home to a altitude terrain low-sloping ancient-glacial-accumulative wooded mid- mountain (3), the limited development of which is determined by the movement of ancient mountain glaciers during glaciation periods (Melnyk, 1999; Melnyk, Karabiniuk, 2018). It is represented by a system of loamy-boulder moraine ridges dissected by a dense network of mountain streams and covered with fir-spruce forests. The largest glaciers in the Pleistocene period and the best-expressed paleo-glacial-accumulative landscape complexes are on the northern and northeastern macroslopes of the Svidovets, Chornohora and Marmarosh massifs. In the landscape structure of the region, geocomplexes of glacial origin are unique and occupy the smallest areas (Table 1).

The most representative in the landscape structure of the Transcarpathian region is the altitude terrain of the steeply sloping erosion-denudation wooded mid-mountains (4), the area of which is 3 302,5 km² and covers the main part of

the mid-mountain landscape tier of the Ukrainian Carpathians. It is characterized by a steep erosional topography formed on massive sandstones and sandstone flysch, and the dominance of beech-fir-spruce and beech forests on weak burozems (Miller et al., 1997; Melnyk, 1999; Melnyk et al., 2018).

The basis of the low-mountain landscape layer is formed by altitude terrains of steeply sloping erosion-denudation forested and secondary meadow lowlands (5) and gently sloping erosion-denudation forested and secondary meadow lowlands (6), which territorially border each other and are formed on the basis of valleys and relief depressions in the places where argillite flysch occurs (Melnyk, 1999). As a result of long-term economic development, a large part of natural beech-fir-spruce and beech forests within localities was destroyed, and secondary meadows were formed in their place, which are actively used as pastures and hayfields in agriculture.

The development and accumulative capacity of the river network of the Tisza River basin during the entire orogenic stage of the development of the Ukrainian Carpathians and Transcarpathian region, in particular, led to the formation of a system of altitude terrains of high and medium terraces (7, 8), terraced the bottom of river valleys (9), etc. (Fig. 9). In the flat area of the Transcarpathian Lowland, altitude terrains with gently undulating surfaces of high terraces (10) and flat, wide, in places swampy surfaces of low terraces, floodplains of rivers and channels (11, 12) composed of pebbles, loamy alluvium, sands and sandy loams are actively developing.

Table 1. Areas of altitude terrains within the Transcarpathian region (calculated by the author)

Altitude terrains index	Area, km ²	Share of the total area, %	Altitude terrains index	Area, km ²	Share of the total area, %
1	244,6	1,90	7	275,7	2,16
2	17,8	0,14	8	291,2	2,28
3	19,2	0,15	9	1207,4	9,48
4	3302,5	25,9	10	353,6	2,77
5	2817,6	22,09	11	1917,3	15,03
6	2019,7	15,84	12	287,1	2,25

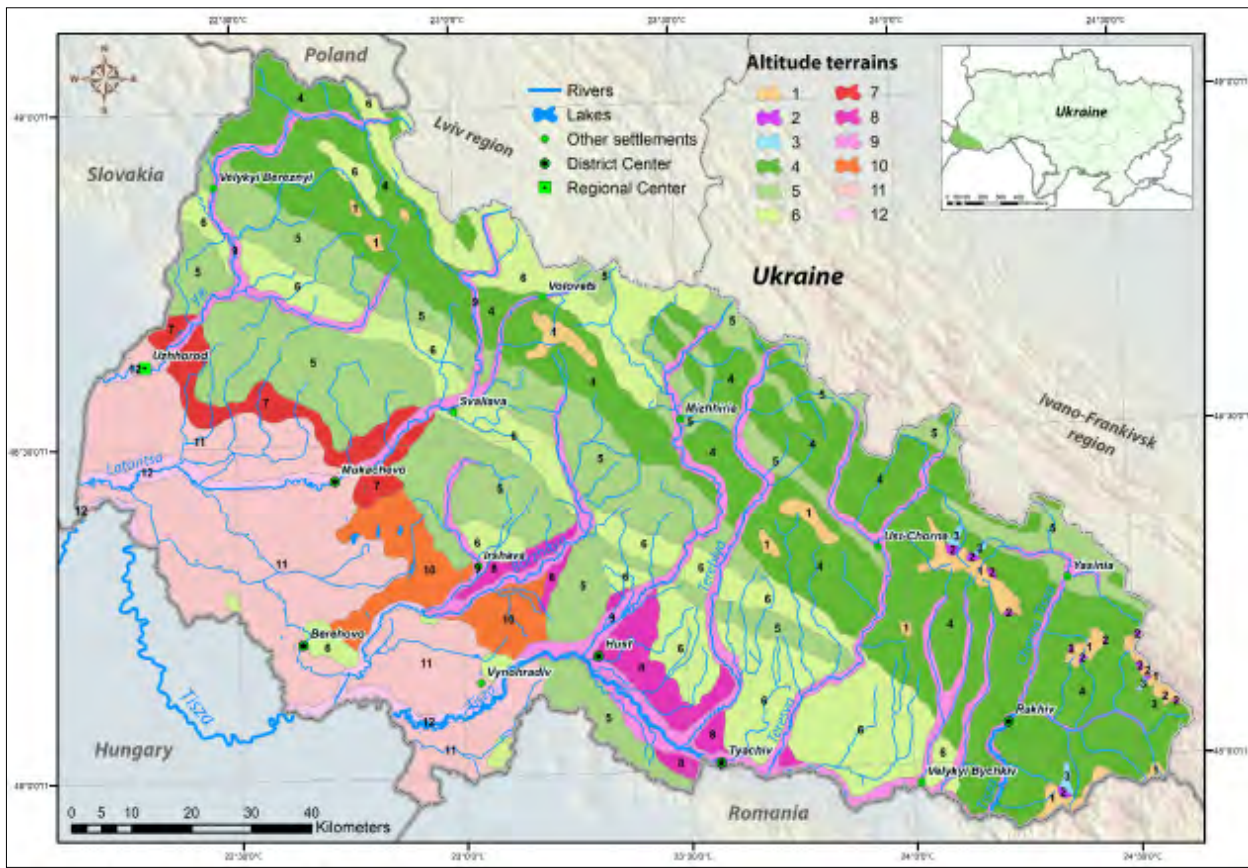


Fig. 8. Landscape map of the Transcarpathian region at the level of altitude terrains (compiled based on the materials of A. Melnyk (1999) and M. Karabiniuk (2020)). Names of high altitude areas according to A. Melnyk (1999)



Fig. 9. River channels and floodplain geocomplexes in the basin of the Borzhava River (photo by Yana Karabiniuk)

Conclusions. In the conditions of climate change and progressive anthropogenic influence on the landscapes of the Transcarpathian region, the study of the structure, properties, peculiarities of the functioning and development of the natural territorial complexes of the studied territory is being actualized. The long history of development and sharp changes in the factors of formation of landscape complexes, the combination of mountain and plain landscapes in the structure of the landscape organization of the territory of the Transcarpathian region caused a high landscape diversity.

As a result of the conducted research of the Transcarpathian region, it was determined that the vertical differentiation of the landscapes of the mountainous part of the territory is characterized by a combination of three landscape tiers – low-mountain, med-mountain and high-mountain. Analysis of the landscape structure of the territory according to the materials of A.V. Melnyk and his own field research shows that the modern landscape structure of the Transcarpathian region is formed by 12 altitude terrains of different origin and with

significantly different properties. Hypsometrically, the highest levels are occupied by altitude terrains of the convex denudation alpine-subalpine highlands and the ancient-glacial subalpine highlands, which are located at altitudes above 1450–1600 m above sea level. The flat landscapes of the Transcarpathian region were formed thanks to the accumulative activity of the river network, and their morphological structure is dominated by flat, wide, in places swampy surfaces of low terraces, river floodplains and their channels.

The obtained results of the research indicate the need for large-scale landscape surveying of the territory of the Transcarpathian region and the development of a modern landscape map in a geo-informational environment. This is necessary for the further definition and analysis of modern landscape diversity, the definition of landscape differentiation of the development of modern physical and geographical processes, and the definition of the general geoecological situation, taking into account the features of the landscape organization of the territory.

Список посилань

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