ISSN 2410-7360 (Print)
ISSN 2411-3913 (Online)

Міністерство освіти і науки України

ВІСНИК

ХАРКІВСЬКОГО
НАЦІОНАЛЬНОГО УНІВЕРСИТЕТУ
імені В. Н. КАРАЗІНА

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Заснована 1970 року

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Затверджено до друку рішенням Вченої ради Харківського національного університету імені В. Н. Каразіна (протокол № 9 від 29.05.2023 р.).

“Вісник” є фаховим виданням категорії А за спеціальностями 103 (науки про Землю) та 106 (географія) (наказ МОН України № 1643 від 28.12.2019 р.) та входить до наступних міжнародних баз даних: *WorldCat*, *BASE* (Bielefeld Academic Search Engine), *ResearchBible*, *TIB/UB* (German National Library of Science and Technology, University Library Hannover), *SBB* (Staatsbibliothek zu Berlin), *Ulrich's Periodicals Directory, EBSCO*, *Index Copernicus, Web of Science* (Emerging Sources Citation Index (ESCI)).

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Статті пройшли внутрішнє та зовнішнє рецензування.

Свідоцтво про державну реєстрацію КВ № 21574-11474Р від 20.08.2015.

З М І С Т

ХРОНІКА

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https://doi.org/10.26565/2410-7360-2023-58-24
UDC 911.2:502.5(285.33)(477.44)
Received 12 March 2023
Accepted 16 May 2023

Degradation risks and prospects for valley and river landscapes conservation in east Podilsk Transnistria (on the example of the Nemiya river)

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ABSTRACT

Formulation of the problem. The urgency of the problem put forward is associated with the growth of anthropogenic development of the unique valley-river landscapes of the East Podolsk Transnistria is still taking place without a comprehensive geographic justification for the organization of nature management of the territory. These valley-river landscapes are unique in terms of the richness of bio- and landscape diversity.

The purpose of the article is to assess the landscape and biotic diversity of the valley-river landscape of the lower reaches of the Nemiya city of the Mogilev-Podolsk-Yampolsky physical-geographical region in order to form priorities for the environmental activities of Transnistria.

Materials and methods. To achieve the goal, a visual survey of the territory of the Nemia basin was carried out. The studies were carried out on the basis of: hydrological-geographical, biogeographical, botanical and zoological generalizations of the results of route observations in the Nemia River valley. Materials were used, including remote and field observations carried out in the Dniester basin. Also, data from various organizations and institutions were used (Vinnitsa Regional Department of Forestry and Hunting, Basin Water Resources Management of the city of Southern Bug, etc.). In particular, data from rural councils of settlements of the Mogilev-Podolsky urban territorial society were used. In the course of the study, such traditional methods as: statistical, literary and cartographic methods, the method of analogies, the method of comparisons and the method of generalizations were used. At the same time, such specific methods were used: a system of modeling, analysis, synthesis methods, cartographic and mathematical methods and methods of forecasting, expeditionary, continuous survey of natural areas, geophysical, identification of landscape components, etc.).

Results. The study made it possible to study the ecotone of landscape and biotic diversity, including the high vulnerability of anthropogenic valley-river landscape complexes, primarily under the influence of mining and industrial developments. The features of the influence on the formation of these landscape complexes of natural and historical and social conditions were also revealed. At the same time, it was possible to establish the modern anthropogenized structure (landscape, phyto- and zoocenotic) of natural and anthropogenic landscapes within the Nemia River valley.

Scientific novelty and practical significance. The conditions for the functioning of the valley-river landscape, the trends and intensity of its changes under the influence of natural and anthropogenic conditions and factors are analysed. The problems of protective belts and water protection zones are considered to assess the possibility of the Nemiya River performing the function of an eco-corridor in the projected regional ecological network. The factors influencing the ecological state of the valley-river landscape are determined. At the same time, microfoci are identified, with which successional, material-energy, transformational and destabilization changes are associated. Based on the studies carried out, proposals were made for the implementation of environmental protection measures for the Nemia River. The results of these researches can become the basis for monitoring the dynamics, development and evolution of landscapes, primarily for the formation of priorities for the environmental activities of Transnistria.

***Keywords**: landscape and biotic diversity, valley-river landscape, wetlands, protected area.*

In cites: Hudzevich Anatoliy, Matviichuk Olexandr, Korobkova Hanna, Hudzevich Ludmyla, Bronnikova Lina (2023). Processing algorithm of weekly records of the Roztochia landscape-geophysical station thermograph M-16AH as a response source of air temperature data. Visnyk of V. N. Karazin Kharkiv National University, series "Geology. Geography. Ecology", (58), 321-335. https://doi.org/10.26565/2410-7360-2023-58-24

Formulation of the problem. The idea of the need for a balanced development of the planet, with the preservation of the ecological balance of the biosphere, is the main principle of environmental protection today. A rich landscape and biotic diversity are able to ensure the stable functioning of a favorable environment for humans. Under the conditions of nature management in Transnistria, forest-steppe landscapes and their components have been modified under the influence of high anthropogenic activity. The structure of landscapes is now dominated by agricultural, water and forestry, residential and industrial, and road. Quite fragmented slopes and tracts of valley-river landscapes remained close to their natural state. For this reason, the need and priority of the study of this region is indisputable. At the same time, the solution of the given problem is an actual direction in national and world geographical science.

Analysis of recent research and publications. Studies of ecological and geographical problems of valley-river landscapes (on the examples of small rivers) of Ukraine are covered in the work of I.P. Kovalchuk [Kovalchuk, 2000]. In particular, he reflected the role of the Kyiv, Kharkiv, Lviv, Odessa and Chernivtsi scientific schools in the study of the rivers of our country. The transformational processes of small and medium-sized rivers in the conditions of an urbanized environment are demonstrated by the works of V.I. Vishnevskyi [Vishnevskyi, 2000], Y. O. Molchak and V.O. Fesyuk [Molchak, Fesyuk, 2007], V.K. Khilchevskyi [Khilchevskyi, 2021; 2022], R.V. Khimko with collaborators [Khimko, Merezhko, Babko, 2003] and others. Attention is drawn to solving the problems of hydrogeological monitoring by L.I. Davybida and Tymkiv M.M. [Davybida, Tymkiv, 2020], V. Melnychuk and G. Protsiv [Melnychuk, Protsiv, 2020]. In the regional aspect, this type of research was conducted by A.V. Gudzevych and R.O. Demets [Hudzevich, Demets, 2018], G.I. Denisyk, L.I. Stefankov and G.S. Khayetsky [Denisyk, Khayetskyi, Stefankov, 2007], O.D. Lavryk with colleagues [Lavryk, Korinnyi, Kyryliuk, Tsymbaliuk, 2022].

Highlighting previously unresolved parts of the overall problem. The focus of the research is the valley-river landscape. In particular, the landscape and biotic diversity of the lower course of the Nemia River, the left tributary of the Dniester River. Its current ecostate is evidence of the destabilization of its structural organization, as it is in a dynamic state and needs constant monitoring studies and the development of recommendations for its preservation. There is a prospect of managing these very complex multifunctional (water flow regulators, sources of water supply for the main watercourse and the population) natural-anthropogenic valley-river landscape complexes in the nature of their functioning. At the same time, there is a need for an in-depth analysis of their integrated ecological and geographical characteristics.

Formulation of the purpose of the article. The research territory is part of the Ozarynetsk Starostyn district of the Mogilev-Podilskyi urban territorial community. According to the physical-geographical zoning of Ukraine [Marynych et al., 2007], it is located within the boundaries of the Mohyli-Podilskyi-Yampilskyi physical-geographical district of the Transnistrian-Eastern-Podilskyi Oblast, the Dnistrovsky-Dniprovsky forest-steppe edge of the forest-steppe zone of the Eastern European plain landscape country. According to geobotanical zoning [Didukh, Shelyag-Sosonko, 2003], it is considered as a separate Central Podil district of hornbeam-oak and oak forests and dry meadows with a potential predominance of forest vegetation within the forest-steppe.

This part of the landscape area is characterized by ravine-beam areas with eroded gray forest soils on the slopes, landslides, steep cliffs, and rocks.

The significant vulnerability of the landscape and biotic diversity of the valley-river landscape of Nemia is under constant anthropogenic pressure. Therefore, it is necessary to implement immediate water and nature protection measures.

The main goal of this study is to assess the landscape and biotic diversity of the valley-river landscape of the lower reaches of the Nemia River in the Mogilev-Podilsko-Yampilsky physical-geographical district. What is necessary for the formation of priorities for environmental protection activities in Transnistria.

Presentation of the main research material. The territory of the Nemia River basin belongs to the hydrological region of Transnistrian Podillia is characterized by a high density of the river network (0.5-0.6 km/km^2) [Khilchevskyi, 2021]. This is explained on the one hand by the fact that the sources of many rivers are located here (in particular, the left tributaries of the Dniester), and on the other hand by the deep cut of the rivers and numerous springs that feed small streams. The area of the pool is 411 km^2. The total length of the river is 64 km.

At present, the anthropogenic impact on the Nemia River valley is typical for the rivers of Middle Transnistria. The water resources of the Nemia River are used for water supply, partly for irrigation. And the Transnistrian part is used for recreation. Fish breeding and construction of hydropower facilities are practiced. In particular, there are 14 abandoned hydroelectric power stations in the middle and lower reaches of the Nemia (4 of them are under reconstruction).

Valuable natural complexes are located on the slopes of the Nemia Valley. As well as within its water protection zone and coastal protection strips of ecological restoration of the Dniester River on both sides of the Nemia estuary. They are valuable from the nature conservation point of view and have been

under protection since the 20th century.

In particular, to the south of the village Ozaryntsi is the Proterozoic Sandstones geological monument of local importance (Fig. 1). Near the village of Nemia is the geological natural monument of national importance "Mohylivskaya World Outcrop" (Fig. 1). At a distance of 2 to 5 km from them, there are a number of botanical reserves of local importance: "Gryhorivska Gora", "Bronnytska Gora", "Kryshtoforivska Gora", "Zvenyacha Dolina", "Bernashivskyi". To the east, at a distance of 6 km, there is a landscape reserve of national importance "Grabarkivskyi" [Hudzevich, 2002].

A valuable plot with the prospect of bequeathing is the tract "Ozarinetska Gora". It is a combination of forested territory with unforested steep slopes of the banks and valley of the Nemiya River in the vicinity of the village Nemiya (Fig. 1). The area of this site is 1 ha [Horbnyak, 2013]. The slopes of the northwestern exposure are sometimes covered with steppe vegetation. From the Red Book of Ukraine (2009), the following grow here: pheasant's eye *Adonis vernalis (L.),* white spanish broom *Chamaecytisus albus (Hacq.) Rothm. (L.) Mill.,* hairy feathergrass *Stipa capillata (L.).*

Regionally rare plant species of the Vinnytsia region are also noted here [Andrienko, Peregrym, 2012]: italian aster *Aster amellus (L.),* snowdrop anemone *Anemone sylvestris (L.),* whitish hyacinth *Hyacinthella leucophaea (C. Koch) Schur*, Spring primrose *Primula veris (L.),* podolsky garlic *Allium podolicum (Aschers. et Graebn) Błocki ex Racib* which are represented in the corresponding biotopes (E2.231). Xerotic groups on loess deposits (*Etytrigia intermedia, Bromopsis inermis*) are represented in biotopes F3.12. Xerophilic low-growing thickets of *Prunion fruticosae* are represented in biotopes E2.111. The *Brachypodium pinnatum* group on fresh and dry rendzins and chernozems are represented in biotopes E2.112. The *Carekh humilis* group of the Central European type is represented in biotopes on dry, carbonate-enriched turf-carbonate soils or rendzins.

In addition, valuable plant groups that are included in the Green Book of Ukraine (2009) grow here: *Caricetum (humilis) festucosum (valesiacae), Seslerietum (heufleranae) teucriosum (chamaedryis), Stipetum (capillatae) brachypodiosum (pinnati).* The high scientific and phytosozological value of the plant cover of the tract and the facts of threats (uprooting, digging, trampling of plants, burning of the plant cover) were revealed. Taking this into account, conservationists proposed the need to take it under protection in the status of a botanical reserve of local importance as early as 2013 [Horbnyak, 2013].

There are currently no direct threats to "Ozarynetsk Mountain" as a promising territory for inheritance. However, in the future it may become an object of trepel development. At least this, as one of the promising areas, is mentioned in the "Report on the State of the Environment in the Vinnytsia Region (2016)", prepared by the Department of Ecology and Natural Resources of the Vinnytsia Regional State Administration. "A number of teprel deposits were discovered in the region, most of which can be developed only underground (tunnels). Explored trepel reserves of the Shlishkovetsky deposit – 1000 m^3, "Slobodska Gora" – 456 thousand m^3, Nemiyskogo – 232 thousand m^3, Nemiyskogo-2 – 500 thousand m^3, Hrushkinsky – 188 thousand m^3, "Ozarinetska Gora" – 15 thousand m^3, Israelivskyi – 14 thousand m^3. Estimated resources of aspen on the northern outskirts of Mogilev-Podilskyi are estimated at 2.4 million m^3, Shlyshkovetsky deposit - 4.5 million m^3, Slobidska Gora - 6 million m^3. The thickness of the trepel layer is from 2 to 3 to 5 to 7 m. It is a relatively soft (at the level of chalk hardness) and quite stable rock, as evidenced by the fact of its well-preserved voluminous cellars. In some areas, it is possible to extract high-quality trepel by an open method" [Report ..., 2020, p. 111].

It should be noted that "Ozarynetska Gora", as well as the territory bordering the villages of Ozaryntsy and Nemia along the valley of the Nemia river, has recently been within the boundaries of the valuable Liadova-Murafa wetland. This wetland area was initially formed with the aim of preserving wetland ecosystems and the species composition of wetland bird species.

Ramsar site No. 2387 Liadova-Murafa was officially established by the decision of the Ramsar Committee dated 04/04/2019 (Fig. 1). The total area of land covering the territory from the village of Lyadova to Cape Yampil is 5394.28 hectares. The protected territory with international status included the botanical reserve "Lyadivsky" and part of the territory of the regional landscape park "Dniester" [Report ..., 2020, p. 111].

According to the Ramsar site, the territory of Liadova-Murafa is important for the preservation of species diversity of fauna and flora. The plant world includes more than 300 species of vascular plants. In particular, 13 types of plants growing on the territory of the land are listed in the Red Book of Ukraine. More than 30 species of fish can be found in the waters of the area. More than 40 species of mammals, 10 species of amphibians and 6 species of reptiles live here. Of which 16 animal species are listed in the Red Book of Ukraine. Also, 30 species are listed in the IUCN Red List. During migrations, stops for food and molting, up to 24,000 birds can be observed here.

Territorially, VBU Liadova-Murafa is a constit uent part of the regional landscape park "Dniester". Since the boundaries of the Dniester park have not

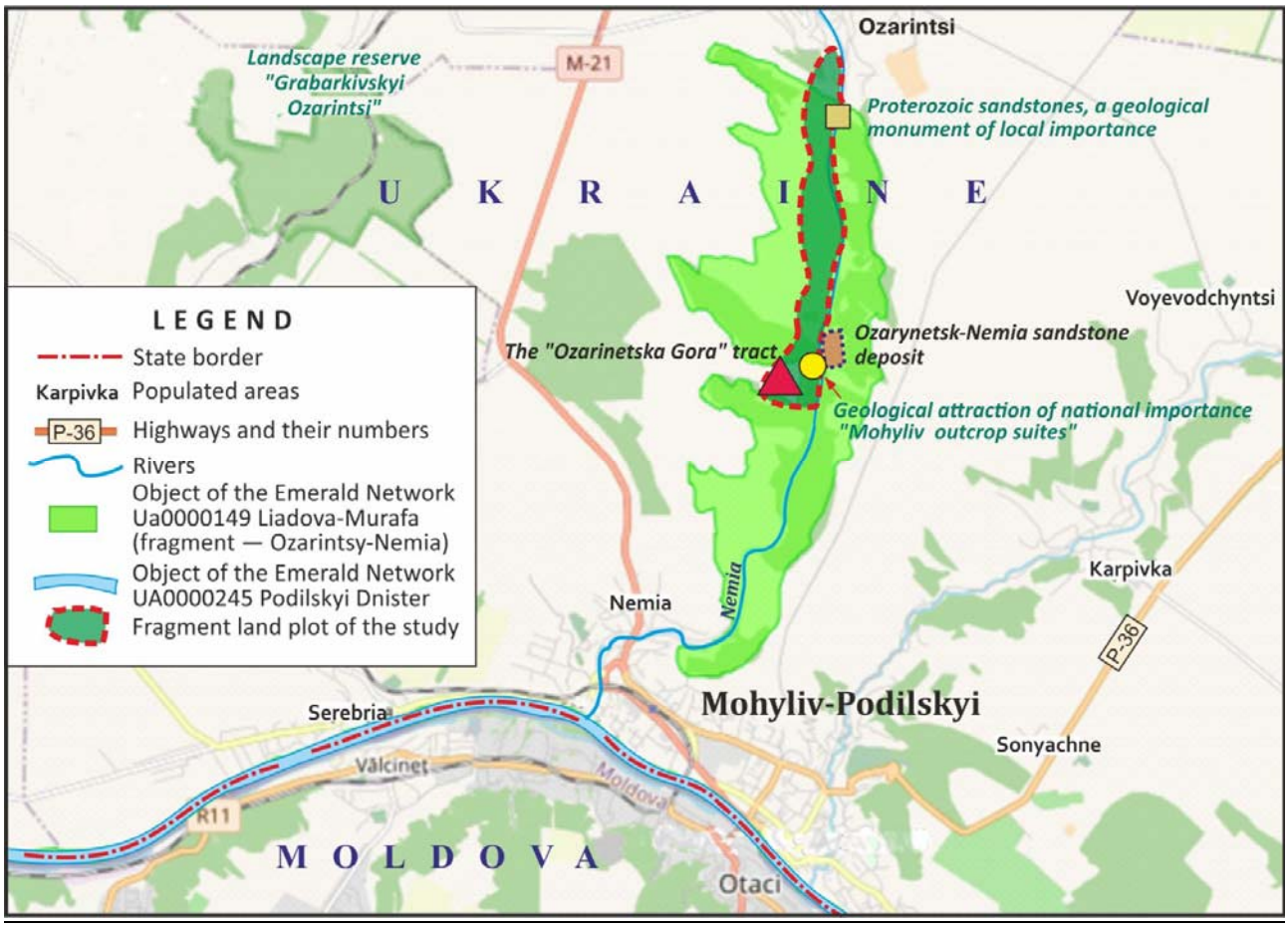

Fig. 1. The research territory of the lower reaches of the Nemia river basin

yet been established in nature, and the boundaries of wetlands of international importance are not provided for by legislation, this creates certain difficulties in agreeing on directions for nature use.

At the same time, the lower course of the Nemia River in the section between the village of Ozaryntsi and the town of Mohyliv-Podilskyi is part of the Liadova-Murafa object of the Emerald Network (Ukrainian translation of the name the Emerald Network). It consists of a section of the Dniester River with its tributaries and forested areas along the river valley (Fig. 1). The territory has very characteristic steep banks, which were created as a result of the formation of marine sediments 420 million years ago. It is an important breeding ground for 106 bird species and 146 migratory species that stop at this site for feeding and moulting. This nature conservation object is especially important for the following species: mallard *Anas platyrhynchos,* simply goldeneye *Bucephala clangula,* mute swan *Cygnus olor* and tufted pochard *Aythya fuligula*. It also contains over 30 species of fish, over 40 species of mammals, ten species of amphibians and six reptiles.

In the future, a management plan will be developed for each of the territories of the Emerald network in order to preserve each of the species and habitats present on its territory. Therefore, an inventory of Liadova-Murafa biodiversity and its monitoring is urgently needed.

Field expedition research of the territory of Middle Transnistria, conducted by the authors of the publication with colleagues during 2017-2022, was aimed at the development of a local and regional econetwork of Transnistria [Hudzevych et al., 2021]. Among other things, they carried out this mission, covering the lower reaches of the Nemia River valley.

The territory of the biodiversity inventory is almost completely consistent with the northern part of the Liadova-Murafa site of the same name for two nature conservation networks of international importance: Emerald and Ramsar sites. At present, it is a combination of the natural-anthropogenic and man-made landscape of the Nemys valley-river system. It is located 5 km north of Mogilev-Podilskyi and 2 km southeast of the village of Ozaryntsi. In the east, it is adjoined by reserve lands (land plots of each category of land, which are not provided for ownership or use by citizens or legal entities).

Slopes disturbed by mining operations are the result of their long-term (at least half a century) arbitrary artisanal development (Fig. 2). They cover an area of almost 12.0 hectares. Currently, as we noted above, they are promising for the production of construction rubble and rubble stone in the Ozaryntsi-2

section of the Ozarynetsko-Nemiyskoye deposit.

The tree and tree-shrub vegetation with the richest species composition is fragmentarily represented only on the northern outskirts of the studied area (Fig. 3). Instead, the natural alluvial slope (overflood terrace) at the site of the 25-meter water protection strip of the Nemiya River was completely destroyed almost to the level of the shoreline in the southern part of the deposit by spontaneous activity (Fig. 4). This causes significant damage to the environment. This riparian slope needs artificial restoration in the form of a riparian dike (embankment) for protection, primarily to prevent siltation of the riverbed and from the harmful effects of toxic chemicals used on adjacent agricultural lands, which have already been transferred to private ownership.

The complex geomorphological structure of the area and the presence of heterogeneous forms of the relief character determine a rather colorful vegetation cover and a variety of settlements. Their groupings quite sensitively indicate a change in living conditions. Currently, among the dominant biotopes, whose codes and names are given according to the National Biotope Catalog of Ukraine [Kuzemko et al., 2018], the following are presented:

• B4.1.2 Coastal grassy thickets along watercourses

• Д1.2.3 Eastern European mesophilic eutrophic broad-leaved forests of the forest-steppe and steppe zones

• T2.2.1 Mesophytic meadows of pasture use (plain pastures)

• Ч8 Psammophytic shrub communities

• Ч4.1 Mesophilic and xeromesophilic shrubs

• C1.1.1 Biotopes of annual xerophytic cereals on roadsides and abandoned lands

• C1.1.2 Biotopes of ruderal juveniles on poor soils

• C1.2.1 Ruderal biotopes of perennial grasses on poor soils

• C1.2.2 Ruderal biotopes of perennial grasses of the nitrophilous type

• C1.2.3 Biotopes of thermophilic perennial grasses

• C1.2.4 Trampled places

• C3.5 Anthropogenic outcrops and dumps without vegetation.

Almost half of the territory consists of ruderal biotopes (C1.1.1, C1.2.1 and C1.1.2), where the total projective coverage of spontaneous vegetation ranges from 20 to 75%. Biotopes adjacent to them are C3.5 (Anthropogenic outcrops and dumps without vegetation) and C1.2.4 (Trampled places). They mainly represent the eastern and southern slopes-walls in the central part of the territory designed for mining activities. This territory is represented by quarries of spontaneously organized activity.

The inverted slope of the northern part of the territory adjacent to the floodplain of the Nemi River and the northwestern sections of the same neighborhood are represented by several biotopes (D1.2.3 Eastern European mesophilic eutrophic broad-leaved forests of the forest-steppe and steppe zones, Ч.8 Psammophytic shrub communities, Ч.4.1 Mesophilic and xeromesophilic shrubs). It forms dense thickets consisting of blackthorn *Prunus spinosa (L.),* common hawthorn *Crataegus monogyna (Jacg.)* and dog rose *Rosa canina (L.).* Between them there are companions: field maple *Acer campestre (L.),* ash-leaved maple *Acer negundo (L.),* European wild pear *Pýrus communis subsp. Pyráster (L.),* Crab Apple *Malus sylvestris (Mil.).* Including the shrub in the composition: black locust *Robinia pseudoacacia (L.),* oleaster *Elaeagnus angustifolia (L.), elderberry Sambucus nigra (L.).* Shrubs alternate in links (25% companion, 75% shrubs). European dewberry *Rubus caesius(L.)* and *common dogwood Cornus sanguinea (L.)* bushes are occasionally added. Closer to the water, *goat willow Salix caprea (L.)* and grey willow *Salix cinerea (L.)*, *white poplar Populus alba* and black poplar *Populus nigra (L.)*, less often groups of common alder *Alnus glutinosa (L.)* are added.

Biotope B4.1.2 (Coastal grass and herbaceous thickets along watercourses) stretches along the channel part of the Nemia River in a strip-fragmentary manner.

Biotopes of perennial grasses (C1.2.3) and mesophytic meadows of pasture use (T2.2.1) occupy relatively small areas of the central parts of the territory of the planned activity. The main edifiers are: common meadow-grass *Poa pratensis (L.),* common couch *Elytrigia repens (L.),* cock's-foot *Dactylis glomerata (L.),* foxtail millet *Setaria italica (L.),* tufted hairgrass *Deschampsia cespitosa (L.)* and others.

Despite the mosaic nature of the microforms of the relief, the vegetation cover of the studied area is relatively poor in terms of structure and species composition. Despite this, one of its characteristic features is the combination of different types of vegetation (petrophytic, steppe, forest and shrub). To some extent, this determines their differentiation according to ecological conditions and reflects different stages of secondary succession (from weedy, grass-herbaceous, herbaceous stages to tree-herbaceous stages). The formation of forest vegetation is also observed, which in the final stages of formation approaches natural phytocenoses in terms of systematic structure.

The structure is dominated by segetal and ruderal coenoelements of synanthropic vegetation. There are also invasive species. Synanthropization of flora is one of the manifestations of its transformation. The presence of a synanthropic element in the flora of a specific territory most objectively characterizes the level of its anthropic transformation. The transition of natural species into the category of synanthropic

Fig. 2. "Walls" tracts of the Nemia Valley after long-term arbitrary development of sandstones

Fig. 3. Steppe grasses and shrubs on the unplowed slopes of the right bank of Nemia

Fig. 4. Bottom pit landscape at the site of the coastal protection zone of the Nemia River

species and the penetration of adventive species, increasing their participation in the formation of vegetation, initiate and deepen such a transformation. The flora of a certain territory will be all the more changed, the fewer analogues of such flora exist in nature in terms of species composition and participation of species in the formation of phytocenoses [Volodymyrets, 2003].

The territory of the quarry of the Ozarynetsk-Nemia sandstone deposit is characterized by a low projective cover, and the majority of it is completely devoid of vegetation. Mining has been carried out here since 1962. The current quarry and dump landscape is located at a distance of 0.3 km from the tract "Ozarinetska Gora" on the left bank of the Nemia River. The main part of the mining and industrial landscape is represented by biotope C3.5 - Anthropogenic outcrops and dumps without vegetation. Low flooded tracts form biotope C4 (Distinctly unnatural water bodies and related structures (flooded part of the quarry).

Amphibians Amphibia and reptiles Reptilia are traditionally the species-poorest classes of chordates in the Podil region [Matviychuk et al., 2015; Reminny, Matviychuk, 2018]. Naturally, their composition is poor, both within the mining and industrial landscape and in the territory of artisanal developments. Thus, the amphibian fauna is represented by only two species: European Toad *Bufo bufo* (Linnaeus, 1758) (Bufonidae, Anura) and Eastern Tree Frog *Hyla orientalis* Bedriaga, 1890 (Hylidae, Anura). The number of each of the named species does not exceed 10 individuals. The poverty of the species composition is determined by: the lack of water bodies suitable for spawning, near the object, its anthropogenic origin, the nature of the substratum, the type of soil and its fractions.

The species structure of the object's herpetofauna is even poorer, represented by only 1 species - Sand Lizard *Lacerta agilis chersonensis* Andrzejowski, 1832 (Lacertidae, Squamata). The estimated number of Lacerta agilis chersonensis in the studied area ranges from 30-50 individuals.

The avifauna of the studied object is formed by 49 species of birds, which are taxonomically represented by 41 genera, united into 24 families and 9 orders (Table 1). The share of such ornithological community in the avifauna structure of Vinnytsia region is only 20.4% [Matviychuk et al., 2017], Ukraine – 11.8% [Fesenko, 2002], Europe – 6.8% [Svensson et al., 1999]. Unlike representatives of the classes Amphibia and Reptilia, birds show a much greater variety of types of ties to the territory. These types of connections with the territory are caused by seasonal changes in its parameters: the amount and structure of feed, the availability of convenient stations for staying, seasonal characteristics of the behavior of each species, etc. In general, taking into account the status of stay, career birds can be divided into 4 main categories: settled, wintering, flying, nesting and migratory (table, fig. 5).

It should be noted that not all resident and nesting and migratory species, whose presence was detected during the surveys, nest directly within the station.

The most closely associated with the territory are sedentary birds, which nest within its boundaries every year, and in the non-reproductive period carry out trophic migrations right there, without flying away to short distances. In 2021-2022, nesting of 4 resident species was noted directly within the current quarry and on the territory where it is planned to expand its area (Table 1, Fig. 6): blackbird (2 pairs), tree sparrow (3 pairs), goldfinch (1 pair) and yellowhammer (1-2 pairs). Their share in the structure of the studied bird group is only 8.2% (Fig. 6).

In search of food, 16 species (32.7%) of birds periodically invade the boundaries of the natural-anthropogenic and man-made valley-river landscape of Nemia. These bird species are resident in the region, but nest in biotopes adjacent to the quarry (Table 1, Fig. 5). These are: goshawk, sparrowhawk,, pheasant, long-eared owl, gray-headed woodpecker, great spotted woodpecker, jay, magpie, raven, wren, fieldfare, blue tit, great tit, nuthatch, greenfinch та linnet.. Almost all of the named species are obligate dendrophils and settle in the shrub-tree thickets of the Nemia River canyon and coniferous and mixed forests on its left bank, downstream from the village Ozaryntsi.

Representatives of nesting and migratory birds increase the species diversity of the object. The species that make up this group nest within the Podilsk region, but carry out regular seasonal spring/autumn migrations, respectively from/to permanent wintering sites. From this group of birds, 9 species, or 18.3% of the entire avifauna, nest directly within the studied territory of the Nemia river valley landscape (Fig. 5): bee-eater (4-5 pairs), skylark (1 pair), yellow wagtail (2 pairs), Red-backed Shrike (1 pair), starling (2 pairs), garden warbler (1 pair), whinchat (1 pair), chaffinch (1 pair) and corn bunting (1 pair).

Like resident birds, 17 species of nesting and migratory birds of Podillia visit the studied area only in search of food. Their share in the structure of the avifauna of the object is 34.7% (Fig. 6): white stork, buzzard, woodpigeon, turtle dove, cuckoo, hoopoe, wryneck, swallow, house martin, pied wagtail, golden oriole, icterine warbler, blackcap, chiffchaff, robin, thrush nightingale i song thrush (Table 1).

During seasonal migrations, only one species (2%) of migratory birds was found, which does not nest on the territory of Podillia, but occurs here exclusively in flight, the hen harrier [Matviychuk et al., 2015]. Note that for this species of harriers, cases of wintering within the region are also known [Matvi-

Table 1

Ecological groups of birds in the vicinity of the village Ozarintsi - Nemia

№	Species	Nature of the stay	Nesting place
1.	White Stork *Ciconia ciconia* (Linnaeus, 1758)	n, t*	
2.	Hen Harrier *Circus cyaneus* (Linnaeus, 1766)	t	
3.	Goshawk *Accipiter gentilis* (Linnaeus, 1758)	s*	
4.	Sparrowhawk *Accipiter nisus* (Linnaeus, 1758)	s*	
5.	Rough-legged Buzzard *Buteo lagopus* (Pontopiddan, 1763)	h	
6.	Buzzard *Buteo buteo* (Linnaeus, 1758)	n, t*	
7.	Pheasant *Phasianus colchicus* Linnaeus, 1758	s*	
8.	Woodpigeon *Columba palumbus* Linnaeus, 1758	n, t*	
9.	Turtle Dove *Streptopelia turtur* (Linnaeus, 1758)	n, t*	
10.	Cuckoo *Cuculus canorus* Linnaeus, 1758	n, t*	
11.	Long-eared Owl *Asio otus* (Linnaeus, 1758)	s*	
12.	Bee-eater *Merops apiaster* Linnaeus, 1758	n, t	B
13.	Hoopoe *Upupa epops* Linnaeus, 1758	n, t*	
14.	Wryneck *Jynx torquilla* Linnaeus, 1758	n, t*	
15.	Grey-headed Woodpecker *Picus canus* Gmelin, 1788	s*	
16.	Great Spotted Woodpecker *Dendrocopos major* (Linnaeus, 1758)	s*	
17.	Swallow *Hirundo rustica* Linnaeus, 1758	n, t*	
18.	House Martin *Delichon urbica* (Linnaeus, 1758)	n, t*	
19.	Skylark *Alauda arvensis* (Linnaeus, 1758)	n, t	GN
20.	Yellow Wagtail *Motacilla flava* Linnaeus, 1758	n, t	GN
21.	Pied Wagtail *Motacilla alba* Linnaeus, 1758	n, t*	
22.	Red-backed Shrike *Lanius collurio* Linnaeus, 1758	n, t	TN
23.	Golden Oriole *Oriolus oriolus* (Linnaeus, 1758)	n, t*	
24.	Starling *Sturnus vulgaris* Linnaeus, 1758	n, t	CN
25.	Jay *Garrulus glandarius* (Linnaeus, 1758)	s*	
26.	Magpie *Pica pica* (Linnaeus, 1758)	s*	
27.	Raven *Corvus corax* Linnaeus, 1758	s*	
28.	Wren *Troglodytes troglodytes* (Linnaeus, 1758)	s*	
29.	Icterine Warbler *Hippolais icterina* (Vieillot, 1817)	n, t*	
30.	Garden Warbler *Sylvia borin* (Boddaert, 1783)	n, t	TN
31.	Blackcap *Sylvia atricapilla* (Linnaeus, 1758)	n, t*	
32.	Chiffchaff *Phylloscopus collybita* (Vieillot, 1817)	n, t*	
33.	Whinchat *Saxicola rubetra* (Linnaeus, 1758)	n, t	GN
34.	Robin *Erithacus rubecula* (Linnaeus, 1758)	n, t*	
35.	Thrush Nightingale *Luscinia luscinia* (Linnaeus, 1758)	n, t*	
36.	Fieldfare *Turdus pilaris* Linnaeus, 1758	s*	
37.	Blackbird *Turdus merula* Linnaeus, 1758	s	TN
38.	Song Thrush *Turdus philomelos* C.L.Brehm, 1831	n, t*	
39.	Blue Tit *Parus caeruleus* Linnaeus, 1758	s*	
40.	Great Tit *Parus major* Linnaeus, 1758	s*	
41.	Nuthatch *Sitta europaea* Linnaeus, 1758	s*	
42.	Tree Sparrow *Passer montanus* (Linnaeus, 1758)	s	CN
43.	Chaffinch *Fringilla coelebs* Linnaeus, 1758	n, t	TN
44.	Greenfinch *Chloris chloris* (Linnaeus, 1758)	s*	
45.	Siskin *Spinus spinus* (Linnaeus, 1758)	h	
46.	Goldfinch *Carduelis carduelis* (Linnaeus, 1758)	s	TN
47.	Linnet *Acanthis cannabina* (Linnaeus, 1758)	s*	
48.	Corn Bunting *Emberiza calandra* (Linnaeus, 1758)	n, t	GN
49.	Yellowhammer *Emberiza citrinella* Linnaeus, 1758	s	GN

Notes: s – Sedentary birds, s* – Sedentary in neighboring habitats, n, t – Breeding and migratory, n, t* – Breeding in neighboring habitats, h – Wintering, t – Migratory birds; B – Burrowing birds, GN – Ground nesting birds, TN – Tree nesting birds, CN – Cavity nesting birds.

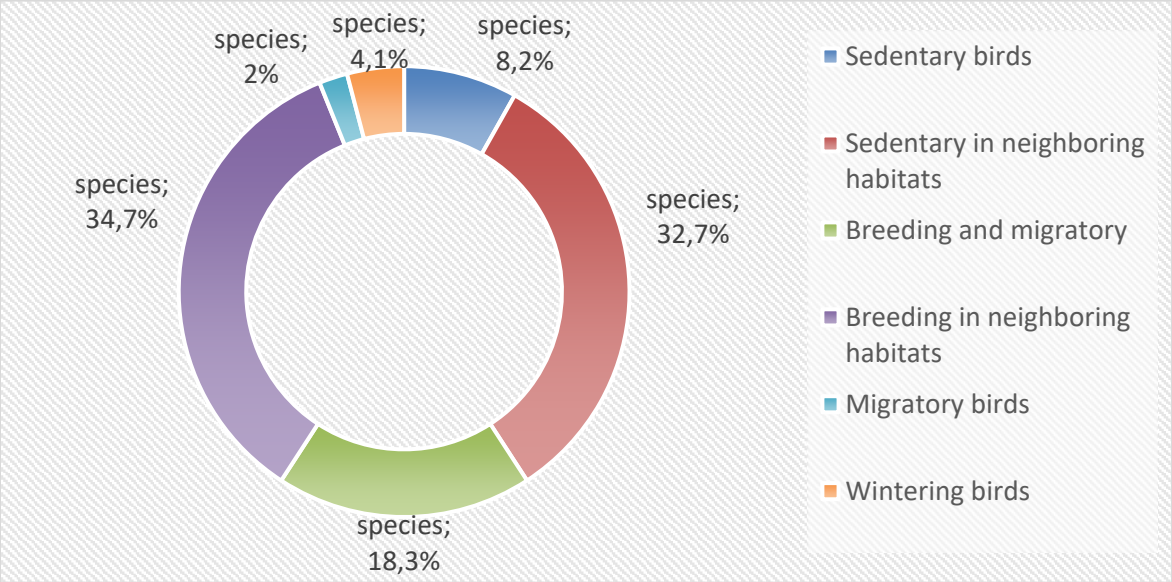

Fig. 5. Ornithofauna of the studied area by the nature of the stay

ychuk et al., 2017]. On 04/21/2022, only one individual of the hen harrier was noted on the territory of the object.

Finally, representatives of 2 species (4.1%) of birds were noted in the bird population structure of the lower part of the Nemia River valley (Fig. 6), which occur in Vinnytsia only in the winter period, regularly migrating here from the nesting parts of their habitats. This is, in particular, the rough-legged buzzard i siskin.. it should be noted that the winter invasions of the rough-legged buzzard within the boundaries of the studied biotope are sporadic and do not occur every year. In contrast to it, winterings of chaffinches are annual. However, in a trophic and topical sense, these birds are associated with a plantation of common alder *Alnus glutinosa* (L.) Gaerth., which grows not directly within the quarry, but in the adjacent canyon of the Nemia River.

Thus, only 13 species of birds demonstrate a permanent connection between the man-made territory (quarry) and the natural-anthropogenic one, on which it is planned to expand its area. Given the specifics of orographic and microclimatic conditions, the nature of vegetation and the species structure of mammalian predators, the nesting avifauna is represented by 4 ecological groups. Naturally, the safest strategy for the location of nests is to arrange them in the crowns and hollows of trees, burrows, etc. Therefore, almost half of the career nesting birds (5 species, 38.5%) are crown-nesting (Table 1, Fig. 6), i.e. they make their nests on side branches or near the main trunk of trees and shrubs. These are, in particular, the red-backed shrike, garden warbler, blackbird, chaffinch i goldfinch.

Two more species (15.4%) of quarry nesting birds (Fig. 6), which make their nests in tree hollows, are closely related to tree vegetation: starling and tree sparrow (Table 1).

Burrows formed in the upper, clayey layer of sedimentary rocks in the western wall of the quarry are used for nesting by common bee-eaters. They are typical, but unique within the studied station, representatives of the ecological group of horn-nesting birds (Table 1, Fig. 6).

About a third (5 species, 38.5%) of the nesting birds of the valley of the lower reaches of the Nemia River are ground-nesting. They arrange their nests in the irregularities of the microrelief of the soil, hiding them at the base of the trunks of trees and shrubs, mounds of grassy plants, etc. These are mainly obligate campophiles: skylark, yellow wagtail, whinchat, corn bunting i yellowhammer (Table 1, Fig. 6).

The peculiarities of the biology of each species determine the spectrum of needs and requirements for the territory during a specific seasonal period. Therefore, the species diversity of the avifauna of the studied object varies significantly in different seasons of the year (Table 2). The greatest species diversity of birds was observed during the period of spring migrations (47 species). In addition to the nesting avifauna, a flying individual of the hen harrier was also noted within the biotope.

The avifauna of tracts changed by artisanal extraction of mountain layers during the reproductive period is one species poorer (46 species). At this time, nesting birds occur directly on its territory and in nearby stations. At this time, the presence of 2 wintering and 1 flying species was not detected.

The early departure of such species as the icterine warbler, garden warbler and whinchat reduce the species diversity of birds to 44 species compared to the reproductive season during the period of autumn migrations.

Reasonably, 22 species of winter avifauna are characterized by the poorest composition. At this

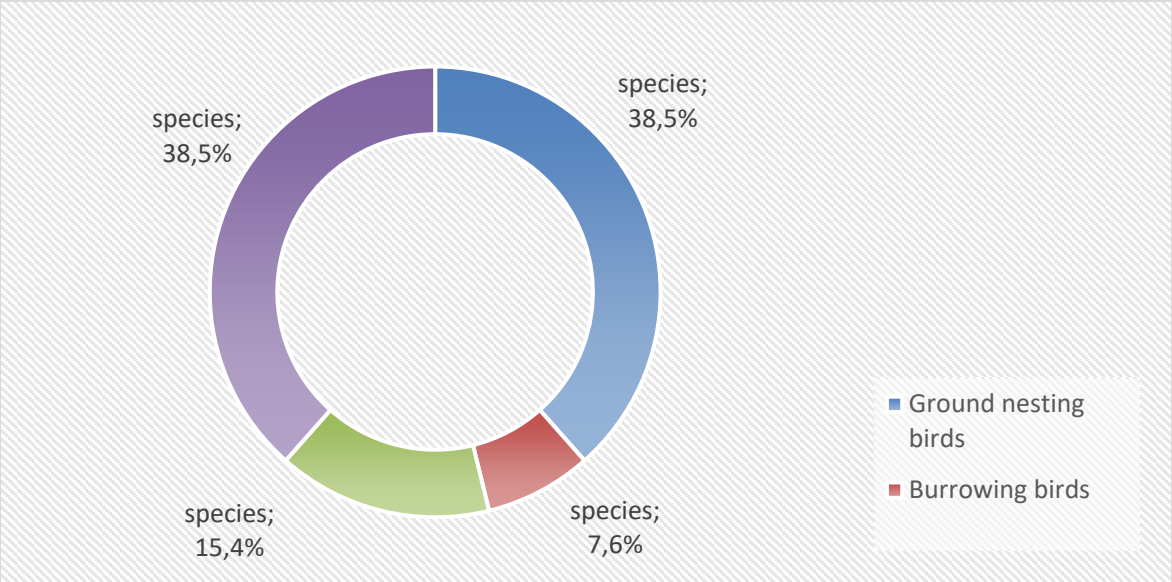

Fig. 6. Categories of breeding birds of the studied area by nesting place

Table 2

Seasonal structure of the avifauna of the studied area

№	Species	Season			
		winter	spring migration	breeding	autumn migration
1.	White Stork *Ciconia ciconia*				
2.	Hen Harrier *Circus cyaneus*				
3.	Goshawk *Accipiter gentilis*				
4.	Sparrowhawk *Accipiter nisus*				
5.	Rough-legged Buzzard *Buteo lagopus*				
6.	Buzzard *Buteo buteo*				
7.	Pheasant *Phasianus colchicus*				
8.	Woodpigeon *Columba palumbus*				
9.	Turtle Dove *Streptopelia turtur*				
10.	Cuckoo *Cuculus canorus*				
11.	Long-eared Owl *Asio otus*				
12.	Bee-eater *Merops apiaster*				
13.	Hoopoe *Upupa epops*				
14.	Wryneck *Jynx torquilla*				
15.	Grey-headed Woodpecker *Picus canus*				
16.	Great Spotted Woodpecker *Dendrocopos major*				
17.	Swallow *Hirundo rustica*				
18.	House Martin *Delichon urbica*				
19.	Skylark *Alauda arvensis*				
20.	Yellow Wagtail *Motacilla flava*				
21.	Pied Wagtail *Motacilla alba*				
22.	Red-backed Shrike *Lanius collurio*				
23.	Golden Oriole *Oriolus oriolus*				
24.	Starling *Sturnus vulgaris*				
25.	Jay *Garrulus glandarius*				
26.	Magpie *Pica pica*				
27.	Raven *Corvus corax*				
28.	Wren *Troglodytes troglodytes*				
29.	Icterine Warbler *Hippolais icterina*				
30.	Garden Warbler *Sylvia borin*				
31.	Blackcap *Sylvia atricapilla*				

32.	Chiffchaff *Phylloscopus collybita*				
33.	Whinchat *Saxicola rubetra*				
34.	Robin *Erithacus rubecula*				
35.	Thrush Nightingale *Luscinia luscinia*				
36.	Fieldfare *Turdus pilaris*				
37.	Blackbird *Turdus merula*				
38.	Song Thrush *Turdus philomelos*				
39.	Blue Tit *Parus caeruleus*				
40.	Great Tit *Parus major*				
41.	Nuthatch *Sitta europaea*				
42.	Tree Sparrow *Passer montanus*				
43.	Chaffinch *Fringilla coelebs*				
44.	Greenfinch *Chloris chloris*				
45.	Siskin *Spinus spinus*				
46.	Goldfinch *Carduelis carduelis*				
47.	Linnet *Acanthis cannabina*				
48.	Corn Bunting *Emberiza calandra*				
49.	Yellowhammer *Emberiza citrinella*				
	Summary	22	47	46	44

time, it is formed only by sedentary and wintering species (Table 2).

Mammalia fauna is represented by 10 native species, which are grouped into 10 genera, 8 families, and 5 orders, which is only 13.5% of the theriofauna of the Vinnytsia region [Matviychuk et al., 2015].

In the taxonomic sense, the mammal fauna of the studied area has the following structure:

Order Lagomorpha Brandt, 1855
Family Leporidae Fischer, 1817
Genus *Lepus* Linnaeus, 1758
European Hare *Lepus europaeus* Pallas, 1778
Order Rodentia Bowdich, 1821
Family Muridae Illiger, 1811
Genus *Apodemus* Kaup, 1829
Striped Field Mouse *Apodemus agrarius* (Pallas, 1771)
Genus *Sylvaemus* Ognev, 1924
Wood Mouse *Sylvaemus sylvaticus* (Linnaeus, 1758)
Family Cricetidae J. Fischer, 1817
Genus *Clethrionomys* Tilesius, 1850
Bank Vole *Clethrionomys glareolus* (Schreber, 1780)
Genus *Microtus* Schrank, 1798
Common Vole *Microtus arvalis* (Pallas, 1778)
Order Eulipotyphla Waddell et al., 1999
Family Erinaceidae Fischer, 1814
Genus *Erinaceus* Linnaeus, 1758
Northern White-Breasted Hedgehog *Erinaceus roumanicus* Barrett-Hamilton, 1900
Family Talpidae Fischer, 1814
Genus *Talpa* Linnaeus, 1758
European Mole *Talpa europaea* Linnaeus, 1758
Family Soricidae Fischer, 1814
Genus *Sorex* Linnaeus, 1758
Common Shrew *Sorex araneus* Linnaeus, 1758
Order Carnivora Bowdich, 1821
Family Canidae Fischer, 1817
Genus *Vulpes* Frisch, 1775
Red Fox *Vulpes vulpes* (Linnaeus, 1758)
Order Artiodactyla Owen, 1848
Family Cervidae Goldfuss, 1820
Genus *Capreolus* Gray, 1821
Roe Deer *Capreolus capreolus* (Linnaeus, 1758)

Similar to birds, mammals exhibit different patterns of territorial attachment. For example, certain species of Muridae and Arvicolidae (Muriformes) and Soricidae (Soriciformes) lead a sedentary lifestyle directly within the object: striped field mouse, wood mouse, bank vole, common vole, common shrew. Most of the mentioned species are included in the diet of the red fox, which carries out regular trophic invasions within the limits of the biotope.

The valley-river area is also used for hunting by: european hare, northern white-breasted hedgehog, european mole, roe deer.

In the future, as a result of the implementation of the project, located nearby on the left bank of the Nemia River, the Ozarynetsk-Nemia sandstone deposit, the attractiveness of the lower reaches of the Nemia as a favorable habitat for animals, in particular avifauna, may increase significantly. After working out the balance reserves of the mineral, the produced pit space will be a terraced mine. In accordance with the Code of Ukraine "On Subsoil", mining enterprises must carry out reclamation of lands disturbed by mining operations. And in this way, bring these lands into a state that allows these lands to be used in the interests of the national economy and returned to the previous land user. The developers plan to carry out reclamation of the bottom of the quarry under the reservoir with an area of more than 10 hectares. The above-water part of the sides of the quarry (length up to 800 m, width up to 200 m) and other disturbed lands will undergo transformation. They are designed for afforestation and planting with tree-shrub and herbaceous species typical for Transnistria. This step seems logical in order to fulfill the function of a buffer zone, for the steppe and forestry landscapes of the steep slopes of the tract of Ozarynetsk Gora, as promising for inclusion in the list of preserved territories.

At the same time, as practice shows [Hudzevich, 2012; Baczynska et al., 2017; Hudzevich et al., 2020; Stephan, Hubbart, 2023], technical solutions should not be applied to areas (primarily artisanal development) that are already experiencing successional processes. This is explained by the fact that self-development disturbed by mining operations creates a mosaic of landscape biota (herbaceous, shrubby and woody cover). At the same time, it contributes to the maintenance of both rare species of animals, in particular bird fauna [Šálek, 2012] and the restoration of species diversity.

Conclusions. The territory of the lower reaches of the Nemia River is generally a realistic reflection of the consequences of age-old nature management carried out in the conditions of the southern part of the Transnistrian-Eastern-Podilskyi physical-geographical region. Its most valuable areas need protection and are already considered as priorities at the national and international levels.

The main problem of their functioning is the possible industrial development of the mountain layers of the slopes of the Nemia river valley by open and underground methods. Extraction of mining mass (sandstones, etc.), like any open-pit mining activity, leads to the formation of a quarry-dump type of landscape) and exerts a local influence on the flora and fauna of adjacent territories (Ozarynetsk-Nemia sandstone deposit). Even after many tens of years after the artisanal extraction of sandstones, in connection with the degradation of natural biocenoses, taxonomic poverty of the flora (most species are synanthropic and invasive) and terrestrial tetrapod fauna is observed. Among other things, there is a decrease in the productivity of plant, mainly cereal groups, due to the transition of dominance to early maturing, less productive forms, which leads to a simplification of their structure.

At the same time, the predominance of spontaneous vegetation can be considered as a transitional stage to the steppe and forest communities typical for the region. Actually, the taxonomic structure of populations of chordate animals of classes Amphibia, Reptilia, Aves and Mammalia is formed by background species typical for the region. The fauna of the natural and anthropogenic territory is formed mainly by animals that carry out daily or seasonal invasions from nearby biotopes. The existence of 20 species, or 32.3% of the recorded representatives of chordates, is directly related to biota disturbed by mining in the past. The species diversity of avifauna, which represents its four main categories: resident, nesting and migratory, wintering and flying, varies significantly in different seasons of the year.

The restoration of quantitative and qualitative parameters of phytocesoses, as well as populations of terrestrial chordates, within the limits of open development of the Ozarynetsk-Nemii sandstone deposit is not considered possible only as a result of successional processes. Because this requires the implementation of a number of complex remediation measures.

In order to form the priorities of environmental protection activities in Transnistria, it is already necessary to cover as wide as possible special field studies, primarily the environmental protection areas of the Emerald network and wetlands.

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Ризики деградації та перспективи збереження долинних та річкових ландшафтів Східноподільського Придністров'я (на прикладі річки Немії)

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Розглянуто проблему долинно-річкового ландшафту нижньої течії р. Немія Могилів-Подільсько-Ямпільського фізико-географічного району Придністровсько-Східно-Подільської фізико-географічної області. Представлене тут ландшафтне й біотичне різноманіття є наслідком вікового природокористування й характеризується різнорідним генезисом – натуральним, природно-антропогенним та антропогенним. Встановлені найцінніші його ділянки потребують охорони та уже розглядаються у якості пріоритетних, відповідно до вимог про охорону дикої флори та фауни і природних середовищ існування в Європі, на різних рівнях природоохоронної організації: регіональному, національному й міжнародному. Зокрема, відзначено важливість досліджуваної території як об'єкта особливого природоохоронного інтересу в силу її одночасного перебування в межах Смарагдової мережі (Емеральд) та в статусі водно-болотного угіддя міжнародного значення (Рамсарські угіддя) під однойменною назвою Liadova-Murafa. Серед загроз їх функціонування – перспективи промислового освоєння гірських верств, які складають схилові місцевості долинно-річкового ландшафту, передусім пісковиків, вапняків і трепелу відкритим та підземним способами, що за ступенем негативного впливу на довкілля є найнесприятливішим. Аналіз видової структури біоценозів схилових місцевостей, порушених самовільними розробками пісковиків у долині р. Немії, вказує на таксономічну бідність і спрощення структури рослинних угруповань (більшість видів є синантропними та інвазійними) й фауни (за винятком орнітофауни, які демонструють значно більшу різноманітність типів зв'язків з територією) та підтверджує деструктивну роль гірничої діяльності. Отримані результати дослідження можуть стати основою для моніторингу динаміки, розвитку й еволюції ландшафтів задля формування пріоритетів природоохоронної діяльності Придністров'я.

***Ключові слова**: ландшафтне й біотичне різноманіття, долинно-річковий ландшафт, водно-болотні угіддя, природоохоронна територія.*

Внесок авторів: всі автори зробили рівний внесок у цю роботу

Надійшла 12 березня 2023 р.
Прийнята 16 травня 2023 р.