UDC: 574.4/.5:581.55 **DOI: https://doi.org/10.53040/abap7.2025.113**

RARE HABITATS IN THE TERRITORY OF GRANITE QUARRIES OF CENTRAL POLISSIA

KHOMIAK Ivan, https://orcid.org/0000-0003-0080-0019
ONYSHCHUK Irina, https://orcid.org/0000-0002-2847-8570
KHOMIAK Anastasia, https://orcid.org/0009-0002-0486-2014
Zhytomyr Ivan Franko State University
Corresponding e-mail: khomyakivan@gmail.com

The establishment of mining facilities leads to alterations in the landscape diversity of a territory. Initially, natural habitats are replaced by anthropogenically transformed ecosystems, often devoid of natural vegetation. During the active extraction of minerals, natural habitats may begin to regenerate in certain parts of the mining operation. This regeneration occurs under varying intensities of anthropogenic pressure, on diverse soil types, and exposed rock outcrops. From this point until the cessation of mining, some of these newly formed habitats may qualify for inclusion in international or national lists of rare habitats. While rare habitats may possess varying direct economic or recreational potential, they invariably provide a greater volume of ecosystem services. This fact necessitates careful consideration during the formulation of reclamation plans for areas disturbed by mining activities.

Research Aim and Objectives. This study aims to investigate the phytocenotic diversity of vegetation within granite quarries in the Central Polissia region and to identify the presence of rare habitats therein. In pursuit of this aim, the following objectives were set:

- To classify plant community descriptions collected from the granite quarry sites in Central Polissia.
- To establish a list of habitats to which the identified plant community syntaxa belong.
- To determine the rarity status of these habitats in accordance with Annex 4 of the Bern Convention Resolution.

Methodology. For this research, we utilized standard geobotanical descriptions collected over a 20-year period (from 2004 to 2024) using a route-expeditionary method. The study encompassed 11 active and abandoned granite quarries within the Central Polissia region. During geobotanical surveys, general characteristics of environmental conditions were recorded, and the projective cover of higher vascular plants was determined using a modified five-point scale, based on the seven-point Braun-Blanquet scale. The scale modification was as follows: 5 points: over 75 %

cover, 4 points: 50–75 %, 3 points: 25–50 %, 2 points: 5–25 %, 1 point: less than 5% (combining categories "1", "+" and "r" of the classic Braun-Blanquet scale).

The collected geobotanical database was structured using "Turboveg for Windows 2.0" software. To determine ecological factor indicators, the natural dynamics indicator, and the integral indicator of anthropogenic transformation, we applied synphytoindication methodology. Environmental factors were assessed using the unified Didukh–Pliuta scale, implemented in a corresponding database. Anthropogenic pressure was evaluated based on the "EcoDBase 5d" database using the 18-point Didukh–Khomyak scale. The natural dynamics indicator was determined using a 21-point scale from Khomyak I.V.'s original methodology. Calculations of synphytoindication indicators were performed using the "Simagrl 1.12" software tool.

Standardized geobotanical descriptions were integrated and processed using "Turboveg for Windows" software. Subsequently, these data were exported to "JUICE 7.1.29" in XML table format. The resulting phytocenotic tables were saved in WCT (JUICE Table format WCT). After verification for duplicate taxa, similar geobotanical descriptions were identified using color coding for subsequent merging. The identification of formed phytocenoses was based on blocks of diagnostic species, in accordance with the taxonomic system presented in the "Prodromus of Ukrainian Vegetation". Nomenclature for higher vascular plant species adhered to "Vascular plants of Ukraine. A nomenclatural checklist".

The determination of habitat rarity status, as per Resolution 4 of the Bern Convention, was based on the principles and criteria outlined in the monograph "National Catalogue of Biotopes of Ukraine".

Results. The vegetation of the studied granite quarry territories in Central Polissia belongs to 19 classes, 31 orders, 50 alliances, and 84 associations according to the Braun-Blanquet system. Specifically, it includes the following classes: *Lemnetea* (associations *Riccietum fluitantis, Lemnetum minoris, Spirodeletum polyrhizae, Lemno-Spirodeletum polyrhizae*), *Potamogetea* (associations *Ranunculetum fluitantis Ceratophylletum demersi, Ceratophylletum submersi, Numpharo lutei-Nymphaetum albae, Potametum natantis, Potametum lucentis*), *Phragmiti-Magnocaricetea* (associations *Glycerietum, Sagitario-Sparganietum emersi, Eleocharitetum palustris, Butomo-Sagittarietum sagittifoliae, Alopecuro-Alismatetum plantaginis-aquaticae, Phragmitetum australis, Typhetum angustifoliae, Typhetum latifoliae, Iridetum pseudocaori, Schoenoplectetum lacustris, Glycerietum maximae, Caricetum elatae, Carici acutae-Glycerietum maximae*), *Molinio-Arrhenatheretea* (associations *Agrostio vinealis-Calamagrostietum epigeioris, Agrostietum vinealis-tenuis, Poo angustifoliae-Arrhenatheretum elatiori, Bromopsidetum inermis, Potentillo argenteae-Poetum angustifoliae, Achillea submiefolium-Dactyletum glomeratae, Festucetum pratensis, Poëtum pratensis, Lolietum perennis, Juncetum effusi, Holcetum lanati Issler, Scirpetum sylvatici, Lysimachio-Filipenduletum, Veronico-Euphorbietum*), *Calluno-Ulicetea* (associations *Calluno-Genistetum*), *Nardetea strictae* (associations *Calluno-*

Nardetum), *Sedo-Scleranthetetea* (associations *Sedo acri-Dianthetum hypanicii* та *Thymo pulegioidis-Sedetum sexangularis*), *Epilobietea angustifolii* (associations *Rubo-Chamaenerietum angustifolii, Rubetum idaei, Calamagrostietum epigii*), *Robinietea* (associations *Cheledonio-Pinetum sylvestris, Cheledonio-Aceratum negundi, Cheledonio-Robinietum, Geo-Aceretum platanoidis, Salicetum capreae*), *Vaccinio-Piceetea* (associations *Cladonio-Pinetum, Dicrano-Pinetum), Salicetea purpurea (associations Salicetum albae, Salici-Populetum, Populetum nigro-albae*), *Alnetea glutinosae* (associations *Ribeso nigri-Alnetum*), *Franguletea* (associations *Salicetum pentandro-cinereae*), *Stellarietea mediae* (associations *Centaureo-Aperetum spicae-venti*, *Violo arvensis-Centaureetum cyani*, *Aphano-Matricarietum*, *Apero spicae-venti-Papaveretum rhoeadis, Echinochloo-Setarietum, Portulacetum oleraceae, Brometum tectorum, Hordeetum murini*), *Artemisietea vulgaris* (associations *Agropyretum repentis, Poo compressae-Tussilaginetum farfarae, Arctietum lappae, Arctio-Artemisietum vulgaris, Leonuro-Arctietum, Echio-Verbascetum, Berteroëtum incanae, Dauco-Picridetum hieracioidis, Onopordetum acanthii, Potentilo-Artemisietum absintii, Tanaceto-Artemisietum vulgaris*), *Polygono arenastri-Poëtea annuae* (associations *Polygonetum arenastri, Poetum annuae*), *Plantagenetea majoris* (associations *Agrostio tenuis-Poetum annuae, Prunello-Plantaginetum, Juncetum tenuis, Potentilletum reptantis, Potentilletum anserinae*), *Galio-Urticetea* (associations *Calystegio-Angelicetum archangelicae, Elytrigio repentis-Aegopodietum podagrariae*), *Bidentetea tripartiti* (associations *Polygonetum hydropiperis, Bidentetum tripartitae, Rumici maritimi-Ranunculetum scelerati*).

Ten rare habitats, listed in Resolution 4 of the Bern Convention, were identified within the territory: C1.32 Free-floating vegetation of eutrophic waterbodies, C1.33 Rooted submerged vegetation of eutrophic waterbodies, C2.34 Eutrophic vegetation of slow-flowing rivers, D5.2 Beds of large sedges normally without freestanding water, E1.71 *Nardus stricta* swards, E2.2 Low and medium altitude hay meadows, E3.4 Moist or wet eutropic and mesotrophic grassland, F4.2 Dry heaths, F9.1 Riverine scrub, G1.11 Riverine *Salix* woodland.

A comparison of phytocenotic diversity before mining operations and in abandoned or reclaimed quarries often reveals paradoxical findings. Changes in microrelief and the exposure of various rock types create conditions conducive to the formation of a greater diversity of plant ecosystems. Among these newly formed ecosystems, rare habitats with high potential for providing ecosystem services are occasionally found.

Conclusions. The vegetation of granite quarry territories in Central Polissia encompasses 19 classes, 31 orders, 50 alliances, and 84 associations according to the Braun-Blanquet system. Our analysis identified 10 rare habitats listed in Resolution 4 of the Bern Convention. A comparison with analogous sites indicates that, in the long term, mining activities can paradoxically lead to an increase in habitat diversity, including its rare components.

Keywords: ecosystem, vegetation restoration, mining, phytocenosis