Report

in the frame of Project Conservation of Natural Heritage for Life in Ukraine, acronym ConNaturLIFE Ukraine, (101148569 — LIFE23-PRE-CZ-ConNaturLIFE Ukraine)

ACTION PLAN FOR CONSERVATION AND RESTORATION OF THE BIOTOPE (NATURAL HABITAT) E1. 2 PERENNIAL CALCAREOUS GRASSLANDS AND BASIC STEPPES

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ACTION PLAN FOR CONSERVATION AND RESTORATION OF THE BIOTOPE (NATURAL HABITAT) E1. 2 PERENNIAL CALCAREOUS GRASSLANDS AND BASIC STEPPES

№	Conservation and restoration measures for the biotope (natural habitat)	Implementing body	Implementation period (years)
1	Inventory of the habitat type E1.2 Perennial calcareous grasslands and basic steppes on protected areas, including Emerald Network sites within administrative regions.	Central executive authority responsible for the development and implementation of state policy in the field of environmental protection. Vinnytsia, Dnipropetrovsk, Donetsk, Zhytomyr, Zakarpattia, Zaporizhzhia, Ivano-Frankivsk, Kyiv Oblasts + Kyiv city, Kirovohrad, Luhansk, Lviv, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernivtsi, Chernihiv Regional State (Military) Administrations (with consent) Research institutions and public organizations (with consent): M.G. Kholodny Institute of Botany of the NAS of Ukraine, F.E. Falz-Fein Askania-Nova Biosphere Reserve of the NAAS of Ukraine, Kherson State University, Ukrainian Nature Conservation Group, Nature Fund of Ukraine, Frankfurt Zoological Society Protected areas in Vinnytsia, Dnipropetrovsk, Donetsk, Zhytomyr, Zakarpattia, Zaporizhzhia, Ivano-	2026-2036

№	Conservation and restoration measures for the biotope (natural habitat)	Implementing body	Implementation period (years)
		Frankivsk, Kyiv Regions and Kyiv city, Kirovohrad, Luhansk, Lviv, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernivtsi, Chernipiv Regions and other relevant specialized organizations	
2	Development of recommendations for the organisation of management of the habitat type E1.2 Perennial calcareous grasslands and basic steppes within the protected areas of the nature reserve fund and in the Emerald Network sites.	Central executive authority responsible for the development and implementation of state policy in the field of environmental protection.	2026-2027
3	Inclusion of management measures for the habitat type E1.2 Perennial calcareous grasslands and basic steppes into projects for the organization of territories and the protection of natural complexes of protected areas and Emerald Network sites.	Central executive authority responsible for the development and implementation of state policy in the field of environmental protection. Protected areas in Vinnytsia, Dnipropetrovsk, Donetsk, Zhytomyr, Zakarpattia, Zaporizhzhia, Ivano-Frankivsk, Kyiv Regions and Kyiv city, Kirovohrad, Luhansk, Lviv, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernivtsi and Chernihiv Regions	2026-2036
4	Organisation of the restoration of steppe areas of the habitat type E1.2 Perennial calcareous grasslands and basic steppes, including those degraded due to	Central executive authority responsible for the development and implementation of state policy in the field of environmental protection. Vinnytsia, Dnipropetrovsk, Donetsk, Zhytomyr, Zakarpattia, Zaporizhzhia,	2026-2036

№	Conservation and restoration measures for the biotope (natural habitat)	Implementing body	Implementation period (years)
	unsustainable land use and military activities.	Ivano-Frankivsk, Kyiv Oblasts + Kyiv city, Kirovohrad, Luhansk, Lviv, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernivtsi, Chernihiv Regional State (Military) Administrations (with consent) Research institutions and non-governmental organizations (with consent): M.G. Kholodny Institute of Botany of the National Academy of Sciences of Ukraine, F.E. Falz-Fein Askania-Nova Biosphere Reserve of the National Academy of Agrarian Sciences of Ukraine, Ukrainian Nature Conservation Group, Nature Fund of Ukraine, Frankfurt Zoological Society, “Rewilding Ukraine”. Protected areas in Vinnytsia, Dnipropetrovsk, Donetsk, Zhytomyr, Zakarpattia, Zaporizhzhia, Ivano-Frankivsk, Kyiv Regions and Kyiv city, Kirovohrad, Luhansk, Lviv, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernivtsi, Chernihiv Regions and other relevant specialized organizations	
5	Organisation of a monitoring system for the conservation status of the habitat type E1.2 Perennial calcareous grasslands and basic steppes in Ukraine within the framework of biodiversity monitoring	Central executive authority responsible for the development and implementation of state policy in the field of environmental protection	2026-2030
6	Protection of the habitat E1.2 Perennial calcareous	Central executive authority responsible for the development and	2026-2027

№	Conservation and restoration measures for the biotope (natural habitat)	Implementing body	Implementation period (years)
	grasslands and basic steppes from ploughing and afforestation	implementation of state policy in the field of environmental protection	
7	Implementation of environmental education activities to raise awareness among various stakeholder groups and the wider public about the importance of the habitat type E1.2 Perennial calcareous grasslands and basic steppes	Research institutions and non-governmental organizations (with consent): M.G. Kholodny Institute of Botany of the NAS of Ukraine, F.E. Falz-Fein Askania-Nova Biosphere Reserve of the NAAS, Ukrainian Nature Conservation Group, Nature Fund of Ukraine, Frankfurt Zoological Society, “Rewilding Ukraine”. Protected areas in Vinnytsia, Dnipropetrovsk, Donetsk, Zhytomyr, Zakarpattia, Zaporizhzhia, Ivano-Frankivsk, Kyiv Regions and Kyiv city, Kirovohrad, Luhansk, Lviv, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernivtsi and Chernihiv Regions	2026-2036
8	Cooperation and coordination of nature conservation measures	M.G. Kholodny Institute of Botany of the NAS of Ukraine, F.E. Falz-Fein Askania-Nova Biosphere Reserve of the NAAS, Ukrainian Nature Conservation Group (with consent)	2026-2036

Annex
to the Action Plan for Conservation and Restoration of the Biotope (Natural Habitat) E1.2 Perennial Calcareous Grasslands and Basic Steppes

CONTENT

Зміст

INTRODUCTION

The Action Plan for Conservation and Restoration of the Biotope (Natural Habitat) E1.2 Perennial calcareous grasslands and basic steppes (hereinafter referred to as the Action Plan) aims to provide recommendations for maintaining and restoring the favourable conservation status of the biotope (natural habitat) E1.2 Perennial calcareous grasslands and basic steppes, protected at the pan-European level in accordance with Resolution 4 of the Convention on the Conservation of European Wildlife and Natural Habitats[1] (hereinafter referred to as the Bern Convention). It is addressed to all stakeholders interested in and involved with the conservation and management of this habitat type, including governmental and non-governmental organizations, local communities, private landowners, specialists such as biologists, and others.

The steppe zone covers approximately 40% of Ukraine's territory; however, only about 2–3% of the original steppe area remains. About one-third of the plant and animal species protected at the national level are representatives of steppe ecosystems. The conservation of rare species of steppe flora and fauna is possible only if their habitats are preserved. The habitat-based concept of biodiversity conservation, implemented through the provisions of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora[2] (hereinafter referred to as the Habitats Directive) and the Bern Convention, envisages conservation of natural habitats and, accordingly, all species of plants and animals that inhabit them.

Steppe ecosystems historically developed under the influence of wild ungulates, which ensured the removal of excess biomass. This key component, essential for the functioning of steppe ecosystems, was subsequently lost due to the extinction of these animals in Europe. In the past, this function was partially compensated by large-scale livestock keeping and grazing, which constituted a significant component of agriculture in the 19th and 20th centuries. However, the decline in livestock numbers and the transition to stall-based husbandry in the 21st century have eliminated this supporting factor. At the same time, this has led to the loss of many groups of insects, birds, and burrowing animals associated with pasture ecosystems. Even greater losses in faunal diversity have occurred due to the ploughing and subsequent fragmentation of steppes, as well as the extensive use of pesticides in agriculture. For these reasons, modern steppe ecosystems are incomplete, as they lack key consumers; without the removal of excess phytomass, steppe areas degrade and become overgrown with trees and shrubs. The long-term persistence of these ecosystems requires continuous removal of phytomass, which is ensured through grazing, mowing, and controlled burning. These measures should be considered as core approaches to the conservation management of steppe ecosystems. Given that nearly all natural steppe ecosystems in Ukraine have been ploughed, there is a clear need for their restoration and defragmentation,

[1] https://zakon.rada.gov.ua/laws/show/995_032#Text
[2] https://zakon.rada.gov.ua/laws/show/987_004-92#Text

which is an essential condition for the conservation of many rare plant and animal species. Restoration is also required due to additional damage to steppe habitats caused by military actions.

This Action Plan outlines the key conservation objectives, priorities, and measures to be implemented at national, regional, and local levels, both within protected areas and beyond. This approach will enable the preservation of existing steppe ecosystems, minimize current threats, and support the restoration of degraded steppe ecosystems affected by unsustainable land use and military actions.

1. GENERAL CHARACTERISTIC

1.1. DEFINITION OF THE HABITAT TYPE AND SUBORDINATE UNITS

1.1.1. IN ACCORDANCE WITH RESOLUTION 4 OF THE BERN CONVENTION

Steppe ecosystems in Ukraine are highly diverse and include many types, with their differentiation driven by distribution across regions with varying soil and climate conditions, geomorphological features, and hydrological characteristics. This diversity is reflected in their classification systems. Below is a list of classification units that may be considered steppe habitats and are covered by this Action Plan.

According to the Interpretation Manual of Habitats from Resolution 4 of the Bern Convention[3], the habitat type **E1.2 Perennial calcareous grasslands and basic steppes** includes perennial herbaceous grasslands, often nutrient-poor and species-rich, found on calcareous and other basic soils in the nemoral and steppe zones, as well as adjacent parts of the sub-boreal and sub-Mediterranean zones. This includes calciphilous grassland habitats of Central and Western Europe, alvar grasslands of the Baltic region, and herbaceous habitats on alkaline soils in the steppe zone. Among the syntaxa listed for this type, the following orders are present in Ukraine: *Brometalia erecti*, *Festucetalia vaginatae*, *Festucetalia valesiacae*, and *Stipo pulcherrimae–Festucetalia pallentis*[4].

1.1.2. ACCORDING TO THE EUNIS CLASSIFICATION (2012 VERSION)

The list of habitats in Resolution 4 of the Bern Convention is based on the 2012 version of the EUNIS (European Nature Information System) classification. The habitat type E1.2 Perennial calcareous grasslands and basic steppes is a unit of this classification system. However, this broad type is represented within the system by a number of lower-level hierarchical units. To better understand the scope and diversity of this habitat type, the original descriptions of each of its subordinate habitat types in the EUNIS system (2012 version) are provided below)[5].

[3] Council of Europe. (2019). *Interpretation manual of the habitats listed in Resolution No. 4 (1996) listing endangered natural habitats requiring specific conservation measures* (4th draft version). Strasbourg: Council of Europe. https://rm.coe.int/16807469e7

[4] Chytrý, M., Řezníčková, M., Novotný, P., Holubová, D., Preislerová, Z., Attorre, F., Biurrun, I., Blažek, P., Bonari, G., Borovyk, D., ... & Axmanová, I. (2024). *FloraVeg.EU — An online database of European vegetation, habitats and flora*. Applied Vegetation Science, 27(3), e12798. https://doi.org/10.1111/avsc.12798

[5] https://eunis.eea.europa.eu/habitats-code-browser.jsp

E1.22 Arid subcontinental steppic grassland (*Festucion valesiacae*)

Open or closed arid, floristically rich steppe-like grasslands of sub-continental areas of Central Europe, typically with *Stipa* spp., *Festuca valesiaca*, *Festuca rupicola* and *Festuca trachyphylla*. Vegetation of alliances such as *Festucion valesiacae* and *Seslerio-Festucion glaucae* with other species like *Festuca pallens*, *Poa badensis*, *Carex humilis*, *Sesleria varia*, *Teucrium montanum*, *Ononis pusilla*, *Helianthemum canum*, *Iris aphylla*, *Onosma tornensis*, *Draba lasiocarpa*, *Scorzonera austriaca* and *Fumana procumbens*.

E1.23 Meso-xerophile subcontinental meadow-steppes (*Cirsio-Brachypodion*)

Meso-xerophile grasslands of Central Europe with *Astragalus danicus*, *Inula spiraeifolia*, *Seseli annuum*, *Linum* spp., *Carex michelii*, *Carex praecox*, *Carex flacca*. Varied plant communities of grasses and herbs mostly in basins and uplands. As a consequence of pasture, a mesophilous tendency often includes widespread *Juniperus communis*. In vegetation communities of the Cirsio-Brachypodion pinnati alliance, common species include *Brachypodium pinnatum*, *Festuca rupicola*, *Cirsium pannonicum*, *Linum flavum*, *Potentilla alba*, *Bromus erectus*, *Coronilla varia*, *Buphthalmum salicifolium*, and *Campanula glomerata*.

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E1.28 Central European calcaro-siliceous grassland

Low-altitude middle European xerophile, rupicolous or psammophilous, grasslands of slightly calcareous substrates, with *Festuca heteropachys*, *Festuca trachyphylla*, *Koeleria macrantha* (*Koeleria gracilis*), *Phleum phleoides*, *Luzula campestris*, *Dianthus deltoides*, *Jasione montana*, *Agrostis tenuis*, *Potentilla erecta*, *Armeria elongata*, *Artemisia campestris*, *Aster linosyris*, *Lychnis viscaria*, *Silene otites*, *Silene nutans*, *Chamaespartium sagittale*, *Campanula patula*, *Potentilla rupestris*, *Helianthemum nummularium ssp. obscurum*, *Helianthemum apenninum*, *Scleranthus perennis*, *Allium senescens ssp. montanum*.

E1.29 *Festuca pallens* grassland

Subcontinental xeric, thermophile grasslands of middle European collinar rock ledges, mostly dominated by the strong tufts of the glaucous *Festuca pallens*, *Festuca sadlerana* and *Festuca pannonica* and of the green *Sesleria albicans*, and with *Dianthus gratianopolitanus*, *Carex humilis*, *Melica ciliata*, *Aster alpinus*, *Artemisia campestris ssp. lednicensis*, *Hieracium* spp., *Biscutella laevigata ssp. varia*, *Teucrium botrys*, *Teucrium montanum*, *Helianthemum canum*, *Iris aphylla*, *Allium strictum*, *Allium senescens ssp. montanum*, locally distributed from French Jura and Rhine valley to sub-Pannonic foothils and Carpathians in Romania. The communities of the *Festucion pallescentis* often occupy isolated stations and include rare or relictual species which impart to many of them a distinctive biogeographical and physiognomic individuality. In particular, rare and highly disjunct western outposts occur in the Meuse basin of the Belgian and French Ardennes, harbouring, among others, very isolated populations of *Draba aizoides var. montana*, *Artemisia alba ssp. saxatilis* and *Hieracium vogesiacum*.

E1.2C Pannonic loess steppic grassland

Grassland communities from the alliance *Festucion valesiacae* of the Pannonic region, rich on *Stipa* species (*Stipa capillata*, *Stipa pulcherrima*, *Stipa joannis*) and herbaceous dicotyledonous species including, among others, *Salvia nemorosa*, *Salvia austriaca*, *Filipendula vulgaris*, *Astragalus austriacus*, *Astragalus exscapus*, *Phlomis tuberosa*, *Crambe tatarica*, *Galium verum*, *Ajuga genevensis*, *Dianthus pontederae*, *Thymus glabrescens*, and grasses, *Festuca rupicola*, *Koeleria macrantha*, established on, notably, loess ridges formed by fluviatile erosion and accumulation. These rare communities are sensitive to grazing and trampling and have been extensively transformed into other grassland types.

E1.2D Ponto-Sarmatic steppes

Steppes of the plain of the western Black Sea, west of the Dniester, of its associated basins, including those of the lower Danube, of Transylvania and of northern Thrace, of the southern edge and valleys of the Podolian, Central Russian and Volga plateaux, with *Stipa capillata*, *Kochia prostrata*, *Koeleria lobata* (*Koeleria degenii*), *Stipa lessingiana*, *Festuca valesiaca*, *Dichanthium ischaemum*(*Bothriochloa ischaemum*), *Medicago minima*, *Brachypodium pinnatum*.

E1.2F Pannonic sand steppes

Formations dominated by medium or tall perennial tuft-forming grasses or suffrutescents, with lacunar ground cover, together with their associated therophyte communities developed on moving or fixed sands within the range of the Pannonic steppes (unit E1.2C), thus in the Pannonic basin and the areas of preponderant influence of its communities. Most of these formations are associated with inland dune systems and relate to unit E1.99 and its subdivisions.

E1.2G Ponto-Sarmatic sand steppes

Formations dominated by medium or tall perennial tuft-forming grasses or suffrutescents, with lacunar ground cover, together with their associated therophyte communities developed on moving or fixed sands within the range of the Ponto-Sarmatic steppes (unit E1.2D) and the regions of influence of their communities. Most of these formations are associated with inland dune systems and and relate to unit E1.9A and its subdivisions.

1.1.3. ACCORDING TO THE EUNIS CLASSIFICATION (VERSION 2020-2021)[6]

A new version of the EUNIS system has now been developed, which differs significantly from the previous both in the scope of units and their coding. For some habitat groups, this classification is still under development, but it is likely that in the near future this system will be implemented in such conservation documents as the Bern Convention and the Habitats Directive. Therefore, below we provide the units that are part of the steppe habitat group and are relevant to this Action Plan.

R11 Pannonian and Pontic sandy steppe

[6] Chytrý, M., Tichý, L., Hennekens, S. M., Knollová, I., Janssen, J. A. M., Rodwell, J. S., Peterka, T., Marcenò, C., Landucci, F., Danihelka, J., Hájek, M., Dengler, J., Novák, P., Zukal, D., Jiménez-Alfaro, B., Mucina, L., Abdulhak, S., Acic, S., Agrillo, E., ... Schaminée, J. H. J. (2020). EUNIS Habitat Classification: Expert system, characteristic species combinations and distribution maps of European habitats. *Applied Vegetation Science*, *23*(4), 648–675. https://doi.org/10.1111/avsc.12519

Rather open steppe grassland dominated by perennial tussock grasses and herbs, with frequent spring annuals and cryptogams, typical of nutrient-poor, sandy soils on plains and dunes through the Pannonian, Pontic and southern Baltic regions. The climate is continental with cold winters, often with long frosts and shallow snow, and hot, droughty summers. Traditionally used for extensive grazing by stock, particularly sheep, but now widely abandoned.

R16 Perennial rocky grassland of Central and Southeastern Europe

Open grassland generally dominated by perennial grasses with rich mixtures of associated rosette herbs, mat-formers and geophytes, and especially towards Southern Europe, annuals. It occurs on shallow, impoverished soils over both calcareous and siliceous bedrocks, through the lowlands and submontane zone of Central and Southern Europe, best developed on steeper ground unsuited for agriculture, but extended where forest clearance and grazing, particularly by goats, have been part of traditional farming.

R18 Perennial rocky calcareous grassland of Subatlantic and Submediterranean Europe

Open grassland dominated by perennials and especially rich in mat-formers, typical of rudimentary, shallow, nutrient-poor, base-rich soils over sloping, rubbly limestone terrain. It occurs in the lowland to submontane belts in subatlantic and submediterranean Western Europe, including some areas at higher altitudes in the Western Mediterranean mountains, which were traditionally maintained by extensive grazing.

R1A Semi-dry perennial calcareous grassland (meadow steppe)

Semi-natural grassland on deeper and not so drought-prone, nutrient-poor, base-rich soils over limestone throughout the lowlands and submontane belts of submediterranean to hemiboreal Europe. Generally closed and dominated by mixtures of graminoids and forbs, often extremely species-rich, with many rare plants and sometimes striking contingents of orchids and varying much across the large range with different sets of continental or submediterranean companions. Dependent on extensive grazing, usually with sheep, or on an annual mowing, and often developed over centuries of traditional pastoralism, contributing to some striking cultural landscapes.

R1B Continental dry steppe

Steppe and steppe-like grassland on mostly base-rich soils over limestones, of varying depth and stoniness, occurring through the lowland to submontane belts of continental Europe. Dominated by plants adapted to long periods of summer drought, mostly tall tussock grasses and perennial forbs, it shows wide variation in species composition and particular topographic location across the substantial range. In more extreme situations, the grasslands are natural, but they often sustain extensive grazing.

R1C Desert steppe

Continental, temperate very dry zonal steppe, occurring in a transition belt between the true steppe region and the semi-desert region of southern Ukraine, the south-east of European Russia and ranging further into Kazakhstan. Dry steppe is dominated by a combination of xerophytic tall and low grasses, e.g. *Agropyron* and *Stipa*, and xerophytic semi-shrubs, e.g. *Artemisia* and *Tanacetum*. Vegetation cover is relatively low, with most biomass belowground. Typically found on southern black soil (chernozems) and light chestnut soils (kastanozems).

1.1.4. ACCORDING TO ANNEX I OF THE HABITATS DIRECTIVE

Within the territory of the European Union, steppes have a limited distribution and are mainly represented by extrazonal steppe areas. Therefore, it is currently quite difficult to find equivalents in Annex I of the Habitats Directive[7] for the full diversity of Ukrainian steppes. At present, steppe habitats in this document are represented by the following types:

6190 Rupicolous pannonic grasslands (*Stipo-Festucetalia pallentis*)

Open, pioneer rock sward associations occurring on steep, dry xeric slopes in medium altitude mountains of the Pannonic basin and adjacent regions at 150-900 m a.sl.. The base rock is limestone, dolomite or calcareous volcanic rock (basalt, andesite, gabbro) and the soils are shallow rendzinas.

6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites)

Dry to semi-dry calcareous grasslands of the *Festuco-Brometea*. This habitat is formed on the one hand by steppic or subcontinental grasslands (*Festucetalia valesiacae*) and, on the other, by the grasslands of more oceanic and sub-Mediterranean regions (*Brometalia erecti*); in the latter case, a distinction is made between primary *Xerobromion* grasslands and secondary (semi-natural) *Mesobromion* grasslands with *Bromus erectus*; the latter are characterised by their rich orchid flora. Abandonment results in thermophile scrub with an intermediate stage of thermophile fringe vegetation (*Trifolio-Geranietea*). Important orchid sites should be interpreted as sites that are important on the basis of one or more of the following three criteria:

(a) the site hosts a rich suite of orchid species

(b) the site hosts an important population of at least one orchid species considered not very common on the national territory

(c) the site hosts one or several orchid species considered to be rare, very rare or exceptional on the national territory.

6240 Sub-Pannonic steppic grasslands

Steppic grasslands, dominated by tussock-grasses, chamaephytes and perennials of the alliance *Festucion vallesiacae* and related syntaxa. These xerotherme communities are developed on southern exposed slopes with AC-soils on rocky substrate and on clay-sandy sedimentation layers enriched with gravels. They are partially of natural, partially of anthropogenic origin.

6250 Pannonic loess steppic grasslands

Grassland communities rich in perennial grasses and herbs on loess deposits. In the past covering large areas, nowadays restricted to specific land forms like loess ridges formed by fluviatile erosion and accumulation.

6260 Pannonic sand steppes

Formations dominated by medium or tall perennial tuft-forming grasses or suffrutescents, with lacunar ground cover, together with their associated therophyte communities developed on mobile or fixed sands (alluvial sands, subfossil dune systems) within the range of the Pannonic steppes (34.91), thus in the Pannonic basin and the areas dominated by its communities. Also includes similar communities in the West Pontic basin (34.A2)

62C0 Ponto-Sarmatic steppes

[7] European Commission. (2013). *Interpretation manual of European Union habitats – EUR 28*. European Union https://www.miteco.gob.es/content/dam/miteco/es/biodiversidad/temas/espacios-protegidos/doc_manual_intp_habitat_ue_tcm30-207191.pdf

Steppes of the plains, plateau and hills of the western Black Sea, west of the Dniester and the basins, including those of the lower Danube, of Transylvania and of northern Thrace, of the southern edge and valleys of the Podolian plateau, of the Central Russian plateau, of the Volga plateau, of Orenburg and of Bachkiria, with grasses such as *Stipa capillata, S. lessingiana, Kochia prostrata, Koeleria lobata (Koeleria degeni), Festuca valesiaca, Dichanthium ischaemum* (syn *Bothriochloa ischaemum*). Includes vegetation in the alliances *Festucion valesiacae, Stipion lessingianae, Agropyro-Kochion* and *Pimpinello-Thymion zygoid*i.

1.1.5. ACCORDING TO THE NATIONAL CATALOGUE OF HABITATS OF UKRAINE[8]

T1.1.2 Sandy grasslands on neutral substrates

These habitats develop on treeless elevated areas of sandy terraces of large rivers, as well as on alluvial deposits in river floodplains, where they are mostly associated with elevated landforms – high ridges and dunes; in the highest near-channel parts of the floodplain, they may also occur on flat areas. Their largest areas are found on the sandy arenas of the lower Dnipro. They are associated with turf-like, sandy and loamy-sandy soils, which in the forest zone may be somewhat podzolized, with a neutral or slightly alkaline soil solution reaction and low nutrient content.

T1.2.1 Petrophyte steppes on siliceous substrata

These habitats develop on granite and gneiss outcrops of the Ukrainian Shield within the steppe zone, mainly on the upper and middle parts of slopes of various exposures and steepness, on shallow soils.

T1.2.2 Petrophyte lowland steppes on carbonate substrata

These habitats develop on outcrops of limestones, dolomites, sandstones (with calcite admixtures), and gypsum (with limestone admixtures). They are primarily found on rocky slopes of various exposures, with gradients of 15-70°, ledges, protrusions, and small carbonate rock outcrops in canyon-like river valleys (the Dniester and its tributaries), the Tovtry ridge (Podilski Tovtry, Medobory), the Kremenets Hills, and the Holohory Hills. They are associated with poorly developed soils, mainly rendzic leptosols (1-3 cm deep) with high calcium content and moderate humus content.

T1.2.3 Petrophyte mountain steppes on carbonate substrata

This habitat represents a petrophytic variant of mountain steppes, occurring at various altitudes on limestone cliffs, residual-denudational and cuesta uplands under conditions of constant erosion. It occupies slopes of different exposures with gradients up to 30° and convex ridge tops. Soils are carbonate mountain meadow-steppe chernozem on limestone-derived eluvium and deluvium, and skeletal rendzinas (sod-carbonate soils). Humus content is 6-10%, and soil reaction ranges from slightly acidic to slightly alkaline (pH 6.0–6.9).

T1.3.1 Meadow steppes on calcareous soils (rendzina)

These habitats primarily develop on fairly steep slopes (10-50°) of gully and ravine systems or river valleys. In the northern part of their range, they may occur on south- and east-facing slopes, but more commonly on north- and west-facing ones. In the northern forest-steppe zone, they are associated with the upper parts of slopes, while in other regions they occur along various slope positions down to the base. Parent rocks are mainly limestones and other carbonate-rich formations such as marls, gypsum, and chalk. Soils are generally shallow, rich in carbonates, with high humus content and relatively high pH levels.

T1.3.2 Meadow steppes on chernozems

[8] National Habitat Catalogue of Ukraine / edited by A.A. Kuzemko, Y.P. Didukh, V.A. Onyshchenko, Ya. Sheffer. – Kyiv: FOP Klymenko Y.Y., 2018. – 442 pages.

In the forest-steppe zone, these habitats develop on the upper and middle parts of moderately steep, predominantly south-facing slopes. In the steppe zone, they occur on the lower parts of mostly north-facing slopes and in depressions. The soils are typical low- to medium-humus chernozems, sometimes eroded, with high carbonate content, formed on loess and limestones.

T1.3.3 Meadow steppe of Mountain Crimea

They occupy level areas and gentle slopes (up to 25°) of various exposures, most often southern, eastern, southeastern, less frequently western and northeastern, but not northern exposures; on the summits and adjacent slopes of Crimean yaylas, descending along valleys to an altitude of 500 m above sea level. Mountain meadow-steppe typical chernozem-like soils of varying thickness, with deep moisture retention during the winter-spring period and drying out in summer. Humus content 5–10%, pH 6.5–7.3.

T1.3.4 Pannonic steppic grasslands

Meadow-steppe communities dominated in the herb layer by tufted narrow-leaved grasses, occurring on the driest and warmest, often rocky slopes of hills and foothills in the Pannonian region. In Ukraine, they occur at the northeastern edge of the distribution and are known only from the Zakarpattia Plain. Here they have persisted as island fragments on steep southern slopes of individual volcanic dome hills, occupying rocky areas with exposures of the parent rock as well as rocky outcrops. The plant cover has high species diversity, formed almost exclusively by xerothermophilous species. The grasslands develop on turf-like, weakly developed, shallow, well-drained rocky skeletal soils with high humus and fine earth content and a significant admixture of scree, or on eroded rocky skeletal substrates overlying neutral to slightly acidic effusive rocks.

T1.4 True forb-bunchgrass and bunchgrass steppes

In the steppe zone, this is the main type of steppe, widespread on plateaus and slopes of various landforms — ravines, valleys, gullies, etc. In the forest-steppe zone, it occurs very rarely on fairly steep slopes with southern exposure. In Crimea, these are habitats of foothill accumulative, residual-denudational, and structural-denudational plains and karst uplands that form the zonal features of steppe vegetation. Soils include various types of chernozems, as well as chestnut and sod-carbonate soils, with a maximum thickness up to 75 cm, sometimes eroded; humus content > 3%. The soil reaction is close to neutral (pH 6.9–7.2). Occasionally, loess, limestone, or granite outcrops appear on the surface.

T1.5 Desert Steppes

These habitats develop on dry steep slopes (40–70°) of various exposures along the shores of seas and coastal lagoons in the extreme south of Ukraine. They are associated with loess exposures, clay shales with gravelly, eroded, poorly developed brown soils on eluvial deposits with signs of salinization, where erosion processes are observed. The climate is dry, ranging from sub-Mediterranean to steppe.

As can be seen from the above analysis, the habitat type E1.2 Perennial calcareous grasslands and steppes**,** which is a third-level unit in the EUNIS hierarchy and included in this form in Resolution 4 of the Bern Convention, represents a high-level hierarchical unit. This habitat type has a broad scope and includes a significant number of subordinate units that differ substantially in many parameters, are interpreted differently in various types of habitat classifications described above, and whose scopes in these classifications are not always compatible. Therefore, for the purposes of this Action Plan, we have divided all steppe habitats that are part of the collective type E1.2 into six main groups:

- Sandy steppes;
- Petrophyte steppes on silicates;
- Petrophyte steppes on carbonates;
- Meadow steppes;

- True steppes;
- Desert steppes.

The correlation of these groups with units of existing habitat classifications is shown in Table 1.1.

Table 1.1. Correlation of main groups of steppe ecosystems with units of existing habitat classification systems

Group	**EUNIS new**	**EUNIS old (previous)**	**NHCU ***	**Annex I HD****
Sandy steppes	R11	E1.2G E1.2F (analog)	T1.1.2	6260
Petrophyte steppes on silicates	R16 (partly)	E1.28	T1.2.1	analog 6190 (partly), 6240 (partly)
Petrophyte steppes on carbonates	R16 (partly) R18	E1.28 (partly) E1.29	T1.2.2 T1.2.3.	analog 6190
Meadow steppes	R1A	E1.23	T1.3.1 T1.3.2 T1.3.3 T1.3.4	6210, 6240 (partly)
True steppes	R1B	E1.2C (analog, partly) E1.2D	T1.4	62C0, 6240 (partly)
Desert steppes	R1C	E1.2C	T1.5	62C0 (partly), 6250 (partly)

* National Habitat Catalogue of Ukraine

** Habitat Directive

Sandy steppes. Black Sea Biosphere Reserve, 2021. Photo by A. Kuzemko.

Petrophytic steppes on silicate rocks, Buzkyi Gard National Nature Park, 2025. Photo: A. Kuzemko.

Petrophytic steppes on carbonate substrates, Podilski Tovtry National Nature Park, 2021. Photo: A. Kuzemko.

Meadow steppes. Pivnichne Podillia National Nature Park, 2017. Photo: A. Kuzemko.

True steppes. Tarutynskyi Steppe Landscape Reserve, 2025. Photo: A. Kuzemko.

Desert steppes. Azov-Syvash National Nature Park, 2021. Photo: A. Kuzemko.

1.1.6. ACCORDING TO THE UNITS OF THE PHYTOSOCIOLOGICAL VEGETATION CLASSIFICATION

According to the current classification scheme of vegetation in Ukraine[9] and Europe[10], steppe vegetation is represented by vascular plant communities belonging to two classes, six orders, and thirteen alliances, as well as by moss and lichen communities belonging to three classes, three orders, and three alliances.

***Koelerio-Corynephoretea canescentis* Klika in Klika et Novák 1941**
Corynephoretalia canescentis Klika 1934
Koelerion glaucae Volk 1931
Festucetalia vaginatae Soó 1957
Festucion beckeri Vicherek 1972

***Festuco-Brometea* Br.-Bl. et Tx. ex Soó 1947**
Festucetalia valesiacae Soó 1947

[9] Prodromus of the Vegetation of Ukraine / D.V. Dubyna, T.P. Dziuba, S.M. Yemelyanova, et al.; edited by D.V. Dubyna, T.P. Dziuba. – Kyiv: Naukova Dumka, 2019. – 784 pages.
[10] Mucina L., Bültmann H., Dierßen K., Theurillat J.-P., Raus T., Čarni A., … Tichý L. (2016). Vegetation of Europe: Hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. *Applied Vegetation Science*, 19(Suppl. 1), 3–264. https://doi.org/10.1111/avsc.12257

Festucion valesiacae Klika 1931
Poo bulbosae-Stipion graniticolae Vynokurov 2014
Adonido vernalis-Stipion tirsae Didukh in Didukh et Mucina 2014
Veronico multifidae-Stipion ponticae Didukh in Didukh et Mucina 2014
Artemisio tauricae-Festucion Korzhenevsky et Klyukin 1991
Stipo pulcherrimae-Festucetalia pallentis Pop 1968
Bromo pannonici-Festucion csikhegyensis Zólyomi 1966 corr. Mucina in Di Pietro et al. 2015 (incl. *Galio campanulatae-Poion versicoloris* Kukovytsia et al. 1997 ex Didukh Vasheniak 2017)
Potentillo arenariae-Linion czerniaevii Krasova et Smetana 1999
Diantho lumnitzeri-Seslerion (Soó 1971) Chytrý et Mucina in Mucina et Kolbek 1993
Androsaco tauricae-Caricion humilis Didukh in Mucina et Didukh 2014
Brachypodietalia pinnati Korneck 1974
Cirsio-Brachypodion pinnati Hadač et Klika in Klika et Hadač 1944 (incl. *Fragario viridis-Trifolion montani* Korotchenko et Didukh 1997)
Tanaceto achilleifolii-Stipetalia lessingianae Lysenko et Mucina in Mucina et al. 2016
Stipion lessingianae Soó 1947

***Ceratodonto purpurei-Polytrichetea piliferi* Mohan 1978**
Peltigeretalia Klement 1949
Cladonion arbusculae Klement 1949 corr. Bültmann in Mucina et al. 2016
***Psoretea decipientis* Mattick ex Follmann 1974**
Toninietalia coeruleonigricantis Hadač 1962
Toninion coeruleonigricantis Hadač in Klika 1948
***Verrucarietea nigrescentis* Wirth 1980**
Aspicilietalia calcareae Roux in Roux et al. 2009
Aspicilion contortae Roux in Roux et al. 2009

1.1.7. ACCORDING TO THE UNITS OF THE GREEN DATA BOOK OF UKRAINE

Steppe communities are represented by 25 syntaxa included in the Green Book of Ukraine[11]:

- Communities of the yellow and Crimean asphodel formation (*Asphodelineta luteae et tauricae*)
- Communities of the desert oat-grass formation (*Helictotrichoneta desertori*)
- Communities of the Scythian broom formation *(Genisteta scythicae*)
- Communities of the Volga calophaca formation (*Calophaceta wolgaricae*)
- Communities of the Scythian caragana formation (*Caraganeta scythicae*)
- Communities of the Brauner's feather-grass formation (*Stipeta braunerii*)
- Communities of the hairy feather-grass formation (*Stipeta capillatae*)
- Communities of the narrow-leaved feather-grass formation (*Stipeta tirsae*)
- Communities of the granite feather-grass formation (*Stipeta graniticolae*)
- Communities of the Dnipro feather-grass formation (*Stipeta borysthenicae*)
- Communities of the Zalessky's feather-grass formation (*Stipeta zalesskii*)
- Communities of the stone-loving feather-grass formation (*Stipeta lithophilae*)
- Communities of the Lessing's feather-grass formation (*Stipeta lessingianae*)
- Communities of the most beautiful feather-grass formation (*Stipeta pulcherrimae*)
- Communities of the plume feather-grass formation (*Stipeta pennatae*)
- Communities of the Pontic feather-grass formation (*Stipeta ponticae*)

[11] Green Book of Ukraine: Rare, Threatened, and Typical Natural Plant Communities Subject to Protection / edited by Y.P. Didukh. – 2nd ed. – Kyiv: Alterpres, 2009. – 448 pages + 48 color pages.

- Communities of the downy-leaved feather-grass formation (*Stipeta dasyphyllae*)
- Communities of the Ukrainian feather-grass formation (*Stipeta ucrainicae*)
- Communities of the pale fescue formation (*Festuceta pallentis*)
- Communities of the dwarf almond formation (*Amygdaleta nanae*)
- Communities of the low sedge formation (*Cariceta humilis*)
- Communities of the feather-grass-leaved wheatgrass formation (*Elytrigieta stipifoliae*)
- Communities of the Heuffel's sesleria formation (*Seslerieta heufleranae*)
- Communities of the naked licorice formation (*Glycyrrhiseta glabrae*)
- Communities of the variegated bluegrass formation (*Poeta versicoloris*)

2. FLORA AND FAUNA

The floristic and faunistic diversity of steppe ecosystems is extremely high; however, different groups of steppe ecosystems are characterised by distinct biotic communities. Below is a list of characteristic species from various taxonomic groups of plants and animals, corresponding to the groups of steppe habitats defined in the previous section. The conservation of steppe habitats ensures the protection of all the listed representatives of flora, mycobiota and fauna. Among them are numerous species protected at the national level, such as those included in the Red Data Book of Ukraine (marked with "*"*); species listed in Resolution 6 of the Bern Convention[12] and Annexes II and IV of the Habitats Directive[13] (marked with "****", referring to species not included in the Red Data Book of Ukraine); and species that are simultaneously listed in the Red Data Book of Ukraine and in one or more international conservation lists – Resolution 6 of the Bern Convention and Annexes II and IV of the Habitats Directive – marked with "***".

2.1. VASCULAR PLANTS

Sandy steppes

Achillea micrantha, Agropyron dasyanthum, A. lavrenkoanum, Allium guttatum, A. savranicum, Alyssum minutum, A. savranicum*, Anchusa gmelinii, Artemisia campestris aggr., Asperula graveolens, Astragalus varius, Bassia laniflora, Carex colchica, Carex liparocarpos*, Centaurea appendicata*, C. arenaria aggr., C. breviceps*, C. donetzica*, C. konkae*, C. margaritacea*, C. margaritalba*, C. protogerberi*, C. protomargaritacea*, C. paczoskii*, Cerastium semidecandrum, Chondrilla juncea, Chrysopogon gryllus*, Cynodon dactylon, Dianthus platyodon, Echinops ritro subsp. ruthenicus, Erysimum canum, Erysimum montanum, Euphorbia seguieriana, Festuca beckeri, Goniolimon graminifolium*, Helichrysum arenarium, Jacobaea borysthenica, Jurinea cyanoides**, J. longifolia, Koeleria glauca aggr., Linaria genistifolia, Linaria odora subsp. dulcis, Lomelosia argentea, Minuartia viscosa, Plantago arenaria, Polygonum arenarium subsp. arenarium, Scirpoides holoschoenus, Scorzonera ensifolia, Secale sylvestre, Silene borysthenica, Silene subconica, Stipa borysthenica*, Thymus pallasianus, Tragopogon borystenicus, Verbascum pinnatifidum.*

[12] Revised Annex I of Resolution 6 (1998) of the Bern Convention listing the species requiring specific habitat conservation measures (year of revision 2011) – https://eunis.eea.europa.eu/references/2443/species

[13] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora – OJ L 206, 22.7.1992. – http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1992L0043:20070101:EN:PDF

Petrophyte steppes on silicates

*Achillea ochroleuca, A. glaberrima***, Allium paniculatum* agg.*, Alyssum murale, Artemisia marschalliana, Carex supina, Centaurea pseudoleucolepis**, Centaurea stoebe* agg.*, Cephalaria uralensis, Cleistogenes bulgarica, Dianthus hypanicus***, Ephedra distachya, Eremogone rigida, Erodium beketowii*, Gagea bohemica, Jurinea granitica, Minuartia setacea* agg.*, Onosma graniticola*, O.tanaitica*, Phleum phleoides, Poa bulbosa, Potentilla incana, Psammophiliella muralis, Pulsatilla pratensis*, Rumex acetosella, Seseli pallasii, Silene hypanica***, Stachys angustifolia*, Stipa graniticola*, Thymus kaljmijussicus*, Tulipa graniticola*, T. hypanica*.*

Petrophyte steppes on carbonates

Allium flavescens, Allium obliquum, Allium podolicum, A.sphaeropodum*, Astragalus exscapus*, A. monspessulanus*, A.odessanus*, Carex humilis, Centaurea marschalliana, Chamaecytisus albus*, Ch. blockianus*, Convolvulus lineatus, Dianthus gratianopolitanus*, D. pseudoserotinus*, Draba podolica***, Echium russicum**, Festuca pallens*, Galium campanulatum, Genista scythica*, G.tetragona***, Gypsophila thyraica*, Haplophyllum suaveolens,Hippocrepis comosa*, Iris hungarica**, Iris pumila, Jurinea stoechadifolia, Linum basarabicum*, Linum czerniaevii, L. tenuifolium, Onosma polyphylla***, Paeonia tenuifolia***, Poa versicolor, Pulsatilla grandis***, P. patens***, P. pratensis*, Scutellaria verna*, Sedum antiquum*, Sempervivum marmoreum*, S.montanum*, S. ruthenicum, Seseli hippomarathrum, S. tortuosum, Stipa capillata*, S. pulcherrima*, Thalictrum foetidum*, T.uncinatum*, Thymus moldavicus, Viola jooi*.*

Meadow steppes

*Adenophora lilifolia**, Adonis vernalis*, Agrimonia eupatoria, Ajuga genevensis, Allium obliquum*, Alopecurus vaginatus, Alyssum trichostachyum, Anchusa barellieri, Anemone narcissiflora*, A. sylvestris, Anthemis tinctoria, Anthericum ramosum, Astragalus dasyanthus*, Betonica officinalis, Botriochloa ischaemum, Brachypodium pinnatum, Briza media, Bromopsis erecta, B. inermis, B. taurica, Bulbocodium versicolor*, Bupleurum falcatum, Campanula glomerata, Carduus collinus*, Carex humilis, C. michelii, C. praecox, C. tomentosa, Carlina cirsioides*, C. onopordifolia***, Centaurea jacea, C. scabiosa, Cerastium biebersteinii*, Chamaecytisus albus*, Ch. austriacus, Ch. blockianus*, Ch. rochelii*, Cirsium pannonicum, Crambe tataria***, Crocus angustifolius*, C. reticulatus*, C. speciosus*, C. tauricus*, Cruciata pedemontana, Cypripedium calceolus***, Daphne cneorum*, Dianthus pseudoserotinus*, Doronicum hungaricum*, Dorycnium pentaphyllum, Dracocephalum austriacum***, D. ruyschiana***, Echium russicum**, Elytrigia intermedia, Euphorbia cyparissias, E. volhynica*, Ferulago sylvatica, Festuca callieri, F. pseudodalmatica, Festuca rupicola, F. valesiaca, Filipendula vulgaris, Fragaria viridis, Fritillaria ruthenica***, Galium campanulatum, G. verum, Geranium columbinum, Gymnadenia conopsea*, Helianthemum chamaecistus, Hieracium tephropodum, Hippocrepis comosa, Hypericum elegans, H. linarioides, H. perforatum, Inula ensifolia, Iris hungarica (як Iris aphylla subsp. hungarica)**, Knautia arvensis, Koeleria cristata, Lembotropis nigricans, Linum basarabicum*, L. catharticum, Lotus corniculatus, Luzula campestris, Medicago falcata, Melica transsilvanica, Orchis militaris*, O. morio (як Anacamptis morio)*, O. purpurea*, O. ustulata (як Neotinea ustulata)*, Paeonia tenuifolia***, Pedicularis sibthorpii, Phleum ambiguum, Ph. phleoides, Phlomis taurica, Pimpinella saxifraga, Plantago media, Poa angustifolia, P. pannonica, Potentilla recta, Prunella grandiflora, Pulsatilla grandis***, P. patens***, P. pratensis*, P. taurica*, Ranunculus polyanthemos, Salvia cremenecensis*, S. pratensis, S. verticillata, Scabiosa ochroleuca, Scorzonera purpurea, Senecio*

besserianus, S. jacobaea, S. tauricus*, Serratula lycopifolia** , Seseli osseum, Stipa capillata*, S. dasyphylla*, S. oreades*, S. pennata*, S. pulcherrima*, S. tirsa*, S. transcarpatica*, Teucrium polium, Thalictrum minus, Thymus marschallianus, Tordylium maximum, Trifolium montanum, T. rubens*, Trinia glauca, Valerianella dentata, Veronica chamaedrys., Viola oreades*.*

True steppes

Adonis vernalis, A. wolgensis*, Agropyron cristatum* subsp. *cristatum, Alyssum trichostachyum, Artemisia austriaca, Asphodeline lutea*, Asperula montana, Astragalus austriacus, Astragalus dasyanthus*, A. exscapus*, A. glaucus*, A. henningii*, A. onobrychis, A. ponticus*, A. ucrainicus, Botriochloa ischaemum, Bromopsis riparia, B. taurica, Bulbocodium versicolor*, Calophaca wolgarica*, Caragana frutex, Caragana scythica*, Carduus uncinatus, Carex supina, Centaurea taliewii*, Colchicum fominii***, Crambe tataria***, Crocus angustifolius*, C. pallasii*, C. reticulatus*, Cymbaria borysthenica*, Elytrigia stipifolia*, Eremogone cephalotes*, Eryngium campestre, Erysimum cuspidatum, Euphorbia nicaeensis* aggr., *Falcaria vulgaris, Festuca valesiaca* aggr., *Galatella villosa, Goniolimon tataricum, Helianthemum stevenii, Hyacinthella pallasiana*, Iris pontica*, Iris pumila, Jurinea multiflora, Kochia prostrata, Koeleria macrantha, Limonium sareptanum, Marrubium praecox, Nepeta parviflora, Paeonia tenuifolia***, Phlomis pungens, Poterium polygamum, Pulsatilla pratensis*, Rumia crithmifoliam*, Salvia nutans, Scorzonera mollis, Serratula erucifolia, Serratula lycopifolia**, S. tanaitica***, Seseli tortuosum, Sisymbrium polymorphum, Stipa adoxa*, S. anomala*, S. asperella*, S. brauneri*, S. capillata*, S. donetzica*, S. fallacina*, S. lessingiana* subsp. *lessingiana*, S. maeotica*, S. majalis*, S. martinovskyi*, S. pontica*, S. pulcherrima*, S. ucrainica*, S. zalesskii*, Tanacetum millefolium, Thymus callieri, T. x dimorphus, Tulipa ophiophylla*, T. scythica*, T. schrenkii*, Verbascum phoeniceum, Veronica multifida.*

Desert steppes

Achillea stepposa, Agropyron cristatum subsp. *cristatum, Allium rotundum, A. regelianum*, Artemisia lerchiana, A. taurica, Astragalus corniculatus, A. reduncus*, Atriplex aucheri, Bassia prostrata, Bromus squarrosus* subsp. *squarrosus, Buglossoides arvensis, Bupleurum tenuissimum*, Camelina microcarpa, Camphorosma monspelliaca, Caragana scythica*, Caroxylon laricinum, Carduus uncinatus, Ceratocephala falcata, Crambe tataria***, Ferula caspica, Galium tenuissimum, Goniolimon tataricum* var. *taurica, Goniolimon rubellum*, Klasea erucifolia, Lamium amplexicaule* var. *amplexicaule, Limonium sareptanum, L. tschurjukiense*, Marrubium peregrinum, Meniocus linifolius, Ornithogalum orthophyllum, Prangos odontalgica, Psathyrostachys juncea*, Ranunculus oxyspermus, Tulipa gesneriana*, Salvia aethiopis, Senecio leucanthemifolius* subsp. *vernalis, Stipa capillata*, S. lessingiana* subsp. *lessingiana*, S. ucrainica*, Valerianella turgida, Verbascum blattaria.*

2.2. BRYOPHYTES

Bryophytes are predominantly found in those steppe habitats that develop on poorly developed soils. Typical species for sandy steppes include *Ceratodon purpureus*, *Polytrichum piliferum*, and *Syntrichia ruralis*; for petrophytic steppes on silicate substrates – *Bryum argenteum*, *Ditrichium*

flexicaule, *Encalypta streptocarpa*, and *Mannia fragrans*; and on carbonate substrates – *Grimmia pulvinata*, *Homalothecium sericeum*, *Hypnum cupressiforme* var. *subjulaceum*, *Pseudocrossidium revolutum*, and *Ptychostomum torquescens*. *Abietinella abietina* is characteristic of meadow steppes, while bryophytes are not characteristic of true and desert steppes.

2.3. LICHENS

Lichens are predominantly found in those types of steppe habitats characterised by a sparse herbaceous layer. Typical species for sandy steppes include *Cetraria aculeata*, *Cladonia foliacea*, and *Xanthoparmelia pokornyi*; for petrophyte steppes – *Agrestia hispida*, Psora decipiens*, Xanthoparmelia camtschadales*, Cladonia symphycarpa, Placidium squamulosum, Scythinium shraderi*, Circinaria fruticulosa**; and for desert steppes – *Athelium imperceptum, Fulgensia fulgens*, F. desertorum*, Placidiopsis cinerascens, Squamarina lentigera**, and *Teloschistes lacunosus**. Lichens are generally absent in the communities of meadow and true steppes.

2.4. FUNGI

Sandy steppes

Agaricus rusiophyllus, Agrocybe pediades, Arrhenia spathulata Disciseda bovista, Coprinellus domesticus, Crinipellis scabella, Cyathus olla, Geastrum elegans, Geastrum floriforme, Geastrum schmidelii, Holocotylon dermoxanthum, Lycoperdon candidum,Macrolepiota excoriata, Marasmius collinus, Marasmius oreades, Phallus hadriani, Pisolithus arhizus, Tulostoma brumale.*

Meadow steppes

Agaricus arvensis, Agaricus augustus, Agaricus bernardii, Agaricus bisporus, Agaricus bitorquis, Agaricus campestris,Agaricus comtulus, Agaricus praerimosus, Agaricus semotus, Agaricus urinascens, Agaricus xanthodermus, Agrocybe dura, Agrocybe praecox, Arrhenia griseopallida, Atheniella flavoalba, Battarrea phalloides*, Calocybe gambosa, Chlorophyllum agaricoides, Chlorophyllum rhacodes, Clitopilus scyphoides, Collybia personata, Collybia phyllophila, Connopus acervatus, Conocybe tenera, Coprinopsis atramentaria, Coprinopsis lagopus, Coprinopsis nivea, Coprinus comatus,Coprinus sterquilinus, Crepidotus luteolus, Deconica coprophila, Deconica merdaria, Disciseda bovista, Entoloma neglectum, Entoloma parkensis, Entoloma prunuloides, Entoloma rhodocylix, Entoloma rhodopolium, Entoloma sinuatum, Ephemerocybe hiascens, Galerina hypnorum Hebeloma sacchariolens, Holocotylon dermoxanthum, Lepiota clypeolaria, Lepiota erminea, Lepista luscina, Leucocoprinus bohusii*, Limacella steppicola*, Loreleia postii,Lycoperdon candidum, Lycoperdon excipuliforme, Macrolepiota excoriata, Marasmius bulliardii, Marasmius collinus, Marasmius oreades, Marasmius wynneae, Melanoleuca grammopodia,Melanoleuca striimarginata, Mycena avenacea, Mycenastrum corium, Mycetinis scorodonius, Parasola conopila, Parasola plicatilis, Phloeomana speirea, Picipes rhizophilus*, Protostropharia semiglobata, Psathyrella ammophila, Psathyrella pygmaea, Psilocybe coronilla, Saproamanita vittadinii, Stropharia melanosperma, Tephrocybe ambusta, Tricholoma album, Tricholomella constricta, Tulostoma brumale, Tulostoma fimbriatum, Volvariella pusilla.*

True steppes

Agaricus arvensis, Agaricus augustus, Agaricus bisporus, Agaricus campestris, Agaricus comtulus, Agaricus cupreobrunneus, Agaricus praerimosus, Agaricus urinascens, Agaricus velenovskyi, Agrocybe dura, Agrocybe pediades, Agrocybe vervacti, Arrhenia griseopallida, Atheniella flavoalba, Battarrea phalloides*, Calvatia cyathiformis, Calvatia gigantea, Candolleomyces candolleanus, Collybia rivulosa, Conocybe tenera, Coprinopsis atramentaria, Coprinus comatus, Cuphophyllus virgineus, Deconica merdaria, Disciseda bovista, Entoloma griseorubellum, Entoloma lividocyanulum, Entoloma saundersii, Entoloma sericeum, Galerina hypnorum, Hebeloma pusillum, Holocotylon dermoxanthum, Infundibulicybe geotropa, Inocybe lacera, Laccaria laccata, Lepiota erminea, Lycoperdon candidum, Lycoperdon excipuliforme, Macrolepiota excoriata, Marasmius oreades, Marasmius wynneae, Melanoleuca striimarginata, Montagnea arenaria, Mycenastrum corium, Omphalina pyxidata, Panaeolus desertorum*, Panaeolus papilionaceus, Parasola plicatilis, Phloeomana speirea, Pleurotus eryngii, Protostropharia semiglobata, Psilocybe coronilla, Rickenella fibula., Saproamanita vittadinii, Stropharia cyanea, Tulostoma brumale, Tulostoma fimbriatum, Tulostoma squamosum, Volvariella pusilla.*

Desert steppes

Agaricus augustus, Agaricus bisporus, Agaricus campestris, Agaricus litoralis, Agaricus porphyrocephalus, Agrocybe pediades, Arrhenia rustica, Chlorophyllum agaricoides, Conocybe tenera, Cystolepiota sistrata, Deconica merdaria, Hebeloma pusillum, Hygrocybe citrina, Hygrocybe miniata, Inocybe lacera, Laccaria laccata, Leucocoprinus leucothites, Macrolepiota excoriata, Marasmius oreades, Marasmius wynneae, Panaeolus desertorum, Phellorinia herculeana*, Protostropharia luteonitens, Protostropharia semiglobata, Psilocybe coronilla, Stropharia melanosperma.*

2.5. INVERTEBRATE ANIMALS

2.5.1. MOLLUSKS

Typical mollusk species of the steppes are *Chondrula tridens*, *Truncatellina cylindrica*, *Pupilla triplicata*, *Pupilla muscorum*, and *Caucasotachea vindobonensis*, which occur in various types of habitats.

2.5.2. SPIDERS

Desert steppes

Mustelicosa dimidiata , Oxyopes heterophthalmus, *Pellenes sericatus*, and *Pseudomogrus vittatus* (subzone of fescue-feather grass steppes); *Rhizodromus histrio* and *Spiracme lendli* (forest-steppe and subzone of fescue-feather grass steppes), *Uloborus walckenaeriu.*

Petrophyte steppes

Alopecosa schmidti, Attulus penicillatus, Berlandina cinerea, Brigittea latens, Drassodes lapidosus, Leptopilos memorialis, Mangora acalypha, Nomisia ausserer.

Meadow steppes

Alopecosa cuneata, Alopecosa pulverulenta, Alopecosa trabalis, Araneus quadratus, Argiope bruennichi, Drassyllus praeficus, Eresus moraviucs, Evarcha arcuata, Mangora acalypha, Tibellus oblongus, Trochosa terricola, Xysticus cristatus.

True steppes

Agalenatea redii, Alopecosa cursor, Alopecosa farinosa,Alopecosa pulverulenta,Alopecosa schmidti, Argiope bruennichi,Brigittea latens, Civizelotes caucasius, Dictynaarundinacea, Drassodes praeficus, Eresus kollari, Gnaphosa leporine, Gnaphosa taurica,Heliophanus flavipes, Heriaeus oblongus, Linyphia tenuipalpis, Mangora acalypha, Oxyopes heterophthalmus, Runcinia grammica, Stemomyphantes lineatus, Thanatus arenarius, Trochosa robusta, Xysticus acerbus, Xysticus cristatus, Xysticus kochi.

Desert steppes

Neoscona adianta, Runcinia lateralis, Thomisus onustus.

2.5.3. INSECTS

Sandy steppes

Acanthaclisis occitanica, Agrotis desertorum, A. vestigialis, Ammobates armeniacus, Ammophila sareptana*, Anatolica abbreviata, A. eremita, Andrena aberrans*, A. nasuta*, Anomala errans, Arctia festiva, Byrsinus fossor, Calomera littoralis, Carabus bessarabicus*, Carcharodus lavatherae, Cephalota besseri*, Ceratophyus polyceros*, Chaetostomella rossica, Chioneosoma pulvereum, Cicindela nordmanni, C. sahlbergii, Cicindela soluta, Colpa klugii*, C. sexmaculata, Cucullia balsamitae, C. inderiensis, C. naruenensis, Cylindera arenaria, Dasypoda braccata*, D. spinigera*, Digrammia rippertaria, Dorcadion equestre*, Drasteria cailino, Empusa pennicornis*, Epatolmis luctifera, Epimecia ustula, Eublemma panonica, Euclidia fortalitium, Eugnorisma miniago, Eugnosta medvedevi*, Eumenes tripunctatus*, Euxoa segnilis, Gymnopleurus mopsus, Lacanobia praedita, Leichenum pictum, Menaccarus arenicola, Mothon sarmaticus, Mylabris fabricii, Oedaspis multifasciata, Orellia stictica, Orgyia antiquoides, Parnopes grandior, Pedinus borysthenicus, P. femoralis, Pimelia subglobosa, Polyphylla alba, Pseudapis femoralis*, Satanas gigas*, Scarabaeus typhon, Schinia cognata, Simyra nervosa, Stelis annulata*, Stizus bipunctatus*, S. fasciatus*, Synclisis baetica, Tapinoma kinburni*, Tentyria nomas, Terellia clarissima, T. cyanoides, Tyria jacobaeae.*

Petrophyte steppes on silicates

Aciura coryli, Amata marjana, Apaustis rupicola, Arethusana arethusa, Aricia anteros, Carabus besseri, Carabus estreicheri, Carabus excellens, Chazara briseis*, Chelis maculosa*, Chersotis margaritacea, Chersotis multangula, Colias chrysotheme*, Cucullia argentina*, Cucullia gozmanyi, Cucullia lactea*, Cucullia santonici, Dichagyris candelisequa, Dichagyris forcipula, Dichagyris nigrescens, Dichagyris orientis, Episema glaucina, Episema tersa, Eublemma polygramma, Euxoa cos, Gnophos furvata, Hadena albimacula, Hadena drenowskii, Hadena magnolii, Hadena persimilis, Hadena scythia, Hadena tephroleuca, Hipparchia statilinus*, Hoplodrina respersa, Hyponephele lupina, Kretania pylaon*, Kretania pylaon*, Luperina taurica, Lygephila lusoria, Melanargia russiae*, Melitaea arduinna, Melitaea aurelia, Melitaea trivia, Muschampia cribrellum, Myopites inulae, Panchrysia deaurata*, Parahypopta caestrum, Phengaris alcon*, Polyommatus coridon, Polyommatus daphnis, Polyommatus dorylas*, Pseudophilotes vicrama, Pyrgus carthami, Pyrgus sidae, Rhyacia lucipeta, Satyrus virbius, Scolitantides orion, Selidosema plumaria, Sideridis kitti, Sphingonaepiopsis gorgoniades*, Terellia virens, Watsonarctia deserta*, Zygaena laeta*.*

Petrophyte steppes on carbonates

Aedophron rhodites, Anadrymadusa retowskii*, Andrena stigmatica*, Apamea platinea, Apaustis rupicola, Asiotmethis tauricus, Bolivaria brachyptera*, Carcharodus lavatherae, Chazara persephone, Chersotis fimbriola, Cucullia blattariae, Dichagyris squalorum, Divaena haywardi*, Enterpia laudeti, Episema korsakovi, Eublemma pudorina, Hadena adriana, Hadena magnolii, Hemaris croatica*, Hyles nicaea*, Libelloides macaronius*, Megachile giraudi*, Megachile lefebvrei*, Ocnogyna parasita, Phengaris arion**, Polymixis rufocincta, Polyommatus damocles, Polyommatus ripartii, Proterebia afra*, Pyrgus cinarae, Pyrgus sidae, Rhyacia arenacea, Satyrus virbius, Sphingo-naepiopsis gorgoniades*, Terellia orheana, Terellia setifera, Tomares callimachus*, Tomares nogelii*.*

Meadow steppes

Amara sabulosa, Apamea sublustris, Aphthona placida, Bolbelasmus unicornis, Bombus pomorum*, Bombus ruderatus*, Calamia tridens, Carabus besseri, Carabus estreicheri*, Carabus excellens, Chaetorellia loricata, Chelis maculosa*, Colias myrmidone***, Cupido osiris, Dichagyris signifera, Eublemma purpurina, Euclidia triquetra, Euxoa vitta, Hadena syriaca, Hemaris tityus*, Hoplodrina respersa, Lacanobia aliena, Lemonia taraxaci*, Lygephila lusoria, Melitaea aurelia, Minois dryas, Myopites inulae, Panchrysia deaurata*, Penthophera morio, Pholidoptera frivaldskyi, Phytoecia tigrina***, Plioreocepta poeciloptera, Polyommatus coridon, Polyommatus daphnis, Polyommatus dorylas*, Polyommatus thersites, Pseudophilotes vicrama, Pyrgus carthami, Saga pedo***, Scotopteryx bipunctaria, Scotopteryx moeniata, Terellia colon, Terellia plagiata, Terellia pseudovirens, Thymelicus acteon, Urophora cuspidata, Urophora lopholomae, Watsonarctia deserta*, Zygaena carniolica, Zygaena laeta*, Zygaena loti, Zygaena minos.*

True steppes

Acontia melanura, Aedophron rhodites, Aegle kaekeritziana, Amata nigricornis, Ammobatoides abdominalis, Andrena nasuta*, Anoplius samariensis*, Anthophora fulvipes, Apsis albolineata, Arethusana arethusa, Bembix olivacea, Bombus argillaceus*, Bombus armeniacus*, Bombus fragrans*, Bombus laesus*, Bombus pomorum*, Bombus zonatus*, Brachycerus sinuatus*, Calophasia opalina, Carabus bessarabicus***, Carabus hungaricus***, Caradrina wullschlegeli, Carcharodus orientalis, Cephalota atrata*, Cerceris tuberculata*, Chazara briseis*, Chelis maculosa*, Colias chrysotheme*, Cucullia argentina*, Cucullia biornata, Cucullia dracunculi, Cucullia lactea*, Cucullia magnifica*, Cucullia santonici, Dichagyris orientis, Dorcadion elegans, Dorcadion equestre*, Eublemma panonica, Euchalcia consona, Euchloe ausonia*, Euidosomus acuminatus, Euxoa basigramma, Euxoa hastifera, Hadena drenowskii, Hadena magnolii, Hadena persimilis, Hadena scythia, Hipparchia statilinus*, Hyponephele lupina, Kretania pylaon*, Libelloides macaronius*, Lixus canescens*, Luperina taurica, Luteohadena literata, Lygephila lubrica, Melanargia russiae*, Merodon nigritarsis*, Muschampia cribrellum, Muschampia tessellum, Mythimna alopecuri, Neolycaena rhymnus, Neolysandra coelestina, Omphalophana antirrhinii, Panchrysia deaurata*, Paracossulus thrips**, Pelatea verucha*, Pelecocera latifrons*, Periphanes cora*, Pseudapis femoralis*, Pseudophilotes bavius***, Ptochus porcellus, Pygopleurus vulpes, Pyrgus sidae, Saga pedo***, Saragossa porosa, Sidemia spilogramma, Sideridis egena, Sphex funerarius*, Sphingonaepiopsis gorgoniades*, Stelis annulata*, Stygioides colchicus, Terellia pseudovirens, Tomares nogelii*, Xestia sareptana, Xestia trifida, Zegris eupheme*, Zekelita antiqualis, Zygaena laeta*.*

Desert steppes

Amata marjana, Anoplius samariensis, Bolivaria brachyptera*, Chazara briseis*, Chelis maculosa*, Cucullia argentina*, Cucullia lactea*, Cucullia santonici, Dichagyris duskei, Dichagyris vallesiaca, Eublemma ostrina, Euchloe ausonia*, Hipparchia statilinus*, Lixus canescens*, Megamecus argentatus, Paracossulus thrips**, Paravespa rex*, Pseudophilotes bavius***, Sphex funerarius*, Triphysa phryne*, Xestia trifida, Zegris eupheme*, Zekelita antiqualis.*

2.6. VERTEBRATE ANIMALS

2.6.1. AMPHIBIANS AND REPTILES

Amphibians are generally uncharacteristic of steppe habitats, primarily due to the absence of permanent water bodies and streams; however, *Pelobates fuscus*, *Pelobates vespertinus*, and *Bufotes viridis* may occasionally occur. In contrast, reptiles are typical inhabitants of these habitats. The most common species characteristic of different types of steppes include *Lacerta agilis*, *Vipera renardi*⋆, and *Dolichophis caspius*⋆ (in the south). In sandy steppes, *Eremias arguta* may occur; in meadow steppes – *Natrix natrix* and *N. tessellata*; while in true and desert steppes – *Podarcis tauricus*, *Elaphe sauromates*⋆, *E. dione*⋆, and *Hierophis caspius*⋆.

2.6.2. BIRDS

Sandy steppes

Widely occur species are *Alauda arvensis* and *Anthus campestris***. Near settlements and farms, *Galerida cristata* is found; near marine coastlines, species such as *Burhinus oedicnemus*, *Charadrius dubius*, *Ch. alexandrinus****, *Larus cachinnans*, *L. ridibundus*, *L. genei* **, *Larus melanocephalus***, *Thalasseus sandvicensis*, *Sterna hirundo***, and *S. albifrons**** occur.

Petrophyte steppes on silicates

Indicator species characteristic specifically for this habitat are *Anthus spinoletta*, *Monticola saxatilis**, *Prunella collaris** (near forest edges), *Emberiza cia*, *Oenanthe pleschanka***.

Petrophyte steppes on carbonates

The most typical species for this habitat type are *Oenanthe isabellina*, *Motacilla flava, Saxicola rubicola, Oenanthe pleschanka**.*

Meadow steppes

Characteristic species include *Buteo rufinus****, *Bubo bubo****, *Athene noctua*, and *Tadorna ferruginea* ***; near settlements, *Galerida cristata* and *Oenanthe oenanthe* are found; common species of open landscapes such as *Motacilla alba*, *M. flava*, *Saxicola rubicola*, and *S. rubetra* also occur.

True steppes

Typical species include *Aquila nipalensi* ***, *Buteo rufinus****, *Otis tarda* **, *Tetrax tetrax****, *Oenanthe oenanthe*, *O. isabellina*, *O. hispanica* (Crimea), *Calandrella rufescens**, *C. brachydactyla***, *Melanocorypha calandra***, *Anthropoides virgo**, *Coracias garrulus****, *Falco naumanni* *, *F. cherrug****, *F. vespertinus***, *Granativora melanocephala*, and *Anthus campestris***; also frequently found are species inhabiting many types of grassland habitats – *Alauda arvensis*, *Galerida cristata*, *Motacilla flava*, *Saxicola rubicola*, and *S. rubetra*.

Desert steppes

Typical species for this habitat type are *Calandrella brachydactyla***, *Galerida cristata*, *Calandrella rufescens**, *Burhinus oedicnemus****, near the seashores and salt lakes *Himantopus himantopus***, *Recurvirostra avosetta****, *Glareola nordmanni*, *G. pratincola****, *Tadorna tadorna*, and *Motacilla feldegg*.

2.6.3. MAMMALS

Sandy steppes

For the Lower Dnipro Sands, the characteristic species are *Stylodipus telum** and *Spalax arenarius****. In the Siverskyi Donets basin, a typical species is *Ellobius talpinus**. The indicator species of this habitat is also *Sicista subtilis s.l.* ***

Petrophyte steppes

Spermophilus citellus *** – southern shores of the Dniester; *Sicista strandi* * – for the Donetsk Ridge in areas of steppe shrub expansion; *Vormela peregusna* *** – in the Donetsk Ridge.

Meadow steppes

*Spermophilus suslicus**** – in pastures. Among predatory mammals, the characteristic species is *Vormela peregusna****.

True steppes

*Spermophilus suslicus****, *S. pygmaeus**, *Sicista subtilis****, *Allactaga major** occur exclusively in pastures; *Spalax microphthalmus*, *S. zemni****, *Nannospalax leucodon* *, and *Mus spicilegus* inhabit both pastures and overgrown areas; *Ellobius talpinus* * is found in the Dnipro region. Among predatory mammals, the characteristic species is *Vormela peregusna* ***.

Desert steppes

Allactaga major, Microtus socialis, Apodemus witherbyi, Sicista subtilis***, Cricetulus migratorius*, Mus spicilegus.*

2.7. ALIEN PLANT SPECIES

Sandy steppes

Ambrosia artemisiifolia, Cenchrus longispinus, Erigeron canadensis, Oenothera biennis, Tribulus terrestri.

Petrophyte steppes on silicates

Anisantha tectorum, Hordeum murinum, Rhus typhina, Syringa vulgaris.

Petrophyte steppes on carbonates

Artemisia annua, Diplotaxis tenuifolia, Gleditsia triacantho.

Meadow steppes

Asclepias siriaca, Erigeron annuus, Erigeron canadensis, Onobrychis viciifolia, Robinia pseudoacacia, Solidago canadensis Symphyotrichum novi-belgii aggr.

True steppes

Grindelia squarrosa, Lepidium perfoliatum, Sisymbrium altissimum, Centaurea diffusa, Ulmus pumila.

Desert steppes

Centaurea diffusa, Elaeagnus angustifolia, Erigeron canadensis, Grindelia squarrosa, Lepidium draba, Peganum garmala.

3. GEOGRAPHICAL DISTRIBUTION

Sandy steppes

In Europe, they are distributed in the southern parts of the Boreal, Continental, Pannonian, and Steppe biogeographical regions; in Ukraine – East European (Sarmatian) province, Polissya subprovince of coniferous-broadleaf forests of the European broadleaf forest zone, East European forest-steppe province, Pontic steppe province, and Black Sea-Azov steppe subprovince of the Eurasian steppe region (mainly in the basins of the Dnipro and Siverskyi Donets Rivers).

Petrophyte steppes on silicates

In Europe – Steppe biogeographical region; in Ukraine – Black Sea-Azov steppe province (Dnipro Upland, Azov Upland), in areas with outcrops of crystalline rocks. River valleys such as Southern Bug, Inhul, Inhulets, Berda, Kalmius, and others.

Petrophyte steppes on carbonates

In Europe – Alpine, Pannonian, Mediterranean, Continental, and Steppe biogeographical regions; in Ukraine – Carpathian-Alpine province (Mountain Crimea and Marmarosh-Chornohora-Svydovets districts), Central European province (Pokuttya-Medobory, Opillia-Kremenets districts), East European province (Bessarabian, Central Podillia, Southern Podillia districts), Pontic province (Dnistro-Buh, Odesa, Buh-Inhulets districts), and Euxinian province. Distribution: in Europe – biogeographical regions (with analogues in the Balkans and Western Caucasus); in Ukraine – Euxinian province.

Meadow steppes

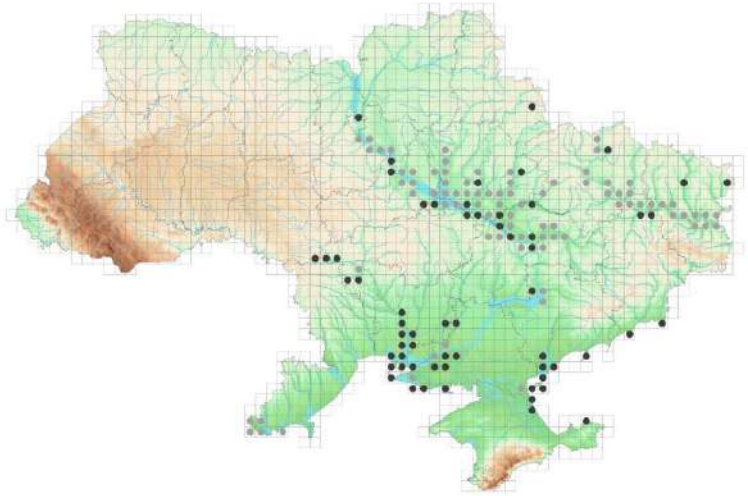
In Europe – Continental, Steppe, Mediterranean, and Pannonian biogeographical regions; in Ukraine – Central European province (Holohory-Kremenets Ridge, Opillia, Pokuttia, Roztochia, Volyn Upland); Pannonian forest-steppe province (Transcarpathian Lowland); East European forest-steppe province (within Western, Northern, and Central Podillia), East European forest-steppe province; Black Sea-Azov steppe province; Euxinian province.

True steppes

In Europe – Steppe biogeographical region; in Ukraine – Pontic Steppe and Euxinian provinces, very rarely – East European forest-steppe province.

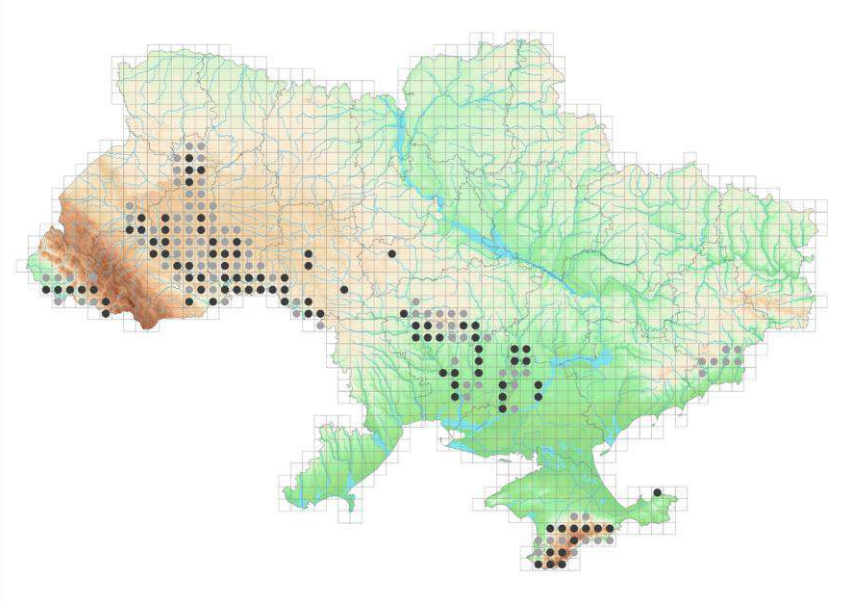
Desert steppes

In Europe – Mediterranean and Steppe biogeographical regions (at the extreme east, on the boundary of steppe and desert zones); in Ukraine – Black Sea-Azov steppe province. These are extrazonal habitats, occurring in the far south along the coasts of the Black and Azov Seas and coastal limans (Tiligul, Berezan, Dnipro-Buh, etc.) and fragmentarily within the lower belt of the Crimean Mountains (up to 450 m a.s.l.), but the largest areas are found in the eastern part, where they are typical for open, eroded slopes.



Distribution map of sandy steppes (here and further, actual distribution is marked with black dots based on specific descriptions presented in phytosociological databases; predicted distribution is indicated by gray dots and determined by modeling results[14])

[14] Atlas of Grassland Habitats of Ukraine / chief editor A.A. Kuzemko. – Chernivtsi: Druk Art, 2022. — 244 pages



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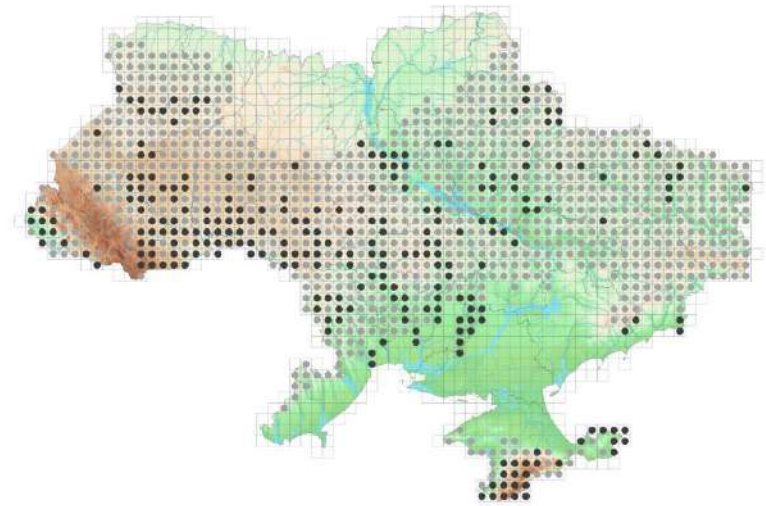
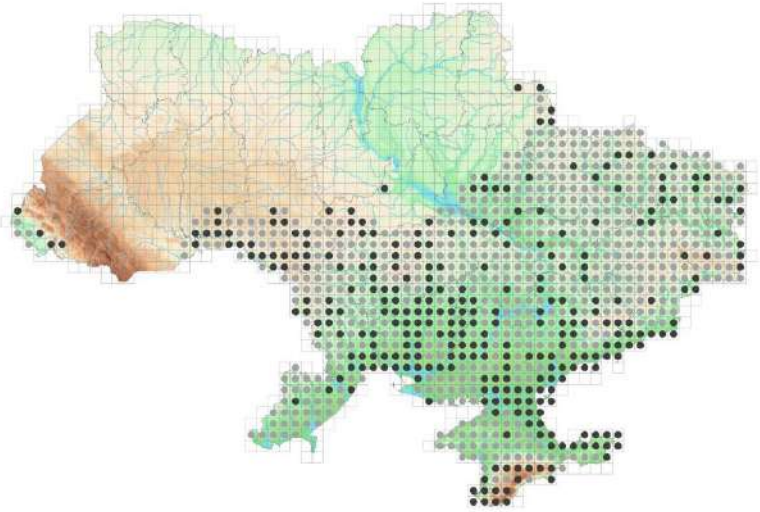
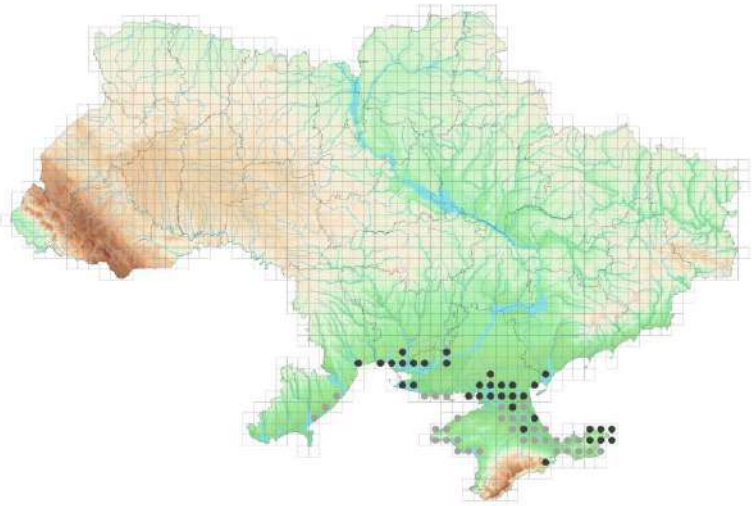
Distribution map of petrophyte steppes



Distribution map of meadow steppes



Distribution map of true steppes



Distribution map of desert steppes

3.5. Social, Historical and Cultural Value of the Steppes of Ukraine

The steppes of Ukraine represent not only valuable habitat types but also an important social, historical, and cultural space that has long been underestimated in public perception and state policy. Unlike forests or mountain areas, steppes have rarely been recognised as having intrinsic natural value, which has led to their marginalisation in public discourse, spatial planning, and nature conservation policy. For a long time, the degradation of steppe ecosystems was not perceived as an environmental problem, and steppes themselves were largely regarded as land available for development.

At the same time, historical evidence shows that steppes played a key role in shaping traditional land use in southern Ukraine. For centuries, they were primarily used as natural pastures and hay meadows, supporting livestock breeding without causing ecosystem degradation. Such forms of land use did not contradict natural processes; on the contrary, their sustainability often helped maintain habitat mosaics and biodiversity. Historically, the main threats to steppes were not these practices themselves, but their radical transformation—above all, ploughing, land reclamation, and other interventions that physically destroyed soil and vegetation cover.

Steppes also held particular importance for indigenous and traditional communities of southern Ukraine, especially for the Crimean Tatars. For this indigenous people, nomadic and semi-nomadic pastoralism was not only an economic activity but also the foundation of socio-cultural development, spatial organisation, and interaction with the natural environment. For many ethnic groups, the steppe was a living landscape in which livelihoods, culture, traditions, and natural rhythms were closely intertwined. The loss of steppes therefore implied not only ecological degradation but also the erosion of socio-cultural systems and national identity.

In addition, steppe landscapes played a defining role in the formation of Ukrainian statehood. The steppe was the setting for key historical processes—from early forms of military and political organisation to the Cossack era, when it became a symbol of freedom, self-governance, and responsibility for the land. This connection is deeply embedded in Ukrainian folklore, folk songs, epic poetry (dumy), historical narratives, and cultural symbols, where the steppe is portrayed as a space of liberty, struggle, and nation-building.

In the current context, steppes can be brought back into active public awareness not only through ecological arguments but also through historical, cultural, and patriotic narratives. The full-scale war launched by the Russian Federation against Ukraine in 2022 is also taking place predominantly within the Steppe natural zone. Recognising the steppe as part of Ukrainian identity and as a space of state formation can help build broad public support for its conservation, particularly under wartime conditions, when issues of territory, landscape, and historical heritage gain heightened significance.

The conservation of Ukraine's steppes requires an integrated approach that combines biodiversity protection with the support of traditional land-use practices and takes into account the socio-cultural context. In no other biome is such integration as essential as in the steppes, where the complete cessation of economic activities may be as harmful as their intensification. Viewing steppes as historically shaped cultural landscapes allows moving beyond their perception as available land for development and provides a foundation for a long-term state policy aimed at preserving this key natural and cultural heritage of Ukraine.

4. ECOSYSTEM SERVICES

The concept of ecosystem services involves considering the human-beneficial functions and characteristics of ecosystems in decision-making processes to ensure sustainable land and resource use, aimed at counteracting overconsumption and the degradation of natural living conditions. To

assess the quantity of ecosystem services provided by steppe ecosystems, we have used the currently widely accepted classification of ecosystem services – the Common International Classification of Ecosystem Services (CICES)[15] (Table. 4.1.). Particular attention should be paid to the high carbon sequestration capacity of steppe ecosystems, which represents a strong argument for attracting funding. In terms of carbon storage (particularly within the soil profile), steppes can compete with forest ecosystems, creating opportunities to access climate finance mechanisms and carbon credit schemes.

Table 4.1. Distribution of Ecosystem Services by Habitat Types Providing Them [16]

Habitats / Services	sandy steppes	petrophitic steppes on silicate substrates	petrophitic steppes on carbonate substrates	meadow steppes	true steppes	desert steppes
Bio-remediation by micro-organisms, algae, plants, and animals	yes	yes	yes	yes	yes	yes
Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals	no	no	no	yes	yes	no
Smell reduction	yes	yes	yes	yes	yes	yes
Noise attenuation	no	no	no	no	no	no
Visual screening	yes	yes	yes	yes	yes	yes
Control of erosion rates	no	no	no	no	no	no
Buffering and attenuation of mass movement	yes	no	no	yes	yes	yes
Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	no	no	no	no	no	no
Wind protection	no	no	no	no	no	no
Fire protection	no	no	no	no	no	no
Pollination (or 'gamete' dispersal in a marine context)	yes	yes	yes	yes	yes	yes
Pollination of plants by abiotic agents (wind, water)	yes	yes	yes	yes	yes	yes
Seed dispersal	yes	yes	yes	yes	yes	yes
Maintaining nursery populations and habitats (Including gene pool protection)	yes	yes	yes	yes	yes	yes
Pest control (including invasive species)	yes	yes	yes	yes	yes	yes

[15] https://cices.eu/resources/

[16] Ecosystem Well-being: Methodology for Calculating Ecosystem Services Using Indirect Methods. – Chernivtsi: Druk Art, 2023. – 184 pages. https://uncg.org.ua/wp-content/uploads/2023/09/ekosyst-dobr_2023.pdf

Habitats / Services	sandy steppes	petrophitic steppes on silicate substrates	petrophitic steppes on carbonate substrates	meadow steppes	true steppes	desert steppes
Disease control	yes	yes	yes	yes	yes	yes
Natural protection against pathogens	yes	yes	yes	yes	yes	yes
Weathering processes and their effect on soil quality	yes	yes	yes	yes	yes	yes
Water transport to groundwater layers	yes	no	no	yes	yes	yes
Soil formation	yes	yes	yes	yes	yes	yes
Symbiotic services of soil organisms	yes	yes	yes	yes	yes	yes
Soil accumulation for crop cultivation	no	no	no	yes	yes	yes
Regulation of the chemical condition of freshwaters by living processes	yes	yes	yes	yes	yes	no
Regulation of the chemical condition of salt waters by living processes	no	no	no	no	no	no
Recharge of groundwater reserves	no	no	no	yes	yes	no
Sequestration of carbon compounds in ecosystems (peat, wood, soil, biodiversity)	no	no	no	yes	yes	yes
Preservation of ancient organic energy deposits	no	no	yes	yes	yes	no
Regulation of temperature and humidity, including ventilation and transpiration	no	yes	yes	yes	yes	yes
Regulation of the water cycle (control of local precipitation and air humidity)	no	no	no	yes	yes	no
Regulation of air composition and quality	yes	yes	yes	yes	yes	yes
Reduction of the impact of late frosts and dry winds on crops	no	no	no	no	no	no
Screening of undesirable topographic features by the landscape	no	no	no	no	no	no
Mediation of flows by natural abiotic structures	no	no	no	no	no	no
Abiotic formations providing protection against floods	no	no	no	no	no	no
Wind shielding by topographic features / Regulation of air flows (reduction of wind strength, speed, and peak gusts)	no	no	no	no	no	no
Global biogeochemical cycles	yes	yes	yes	yes	yes	yes
Landscapes and abiotic features attractive for tourism, photography, and painting	yes	yes	yes	yes	yes	yes
Landscape features attractive for sports competitions (e.g. rock formations)	no	yes	no	no	no	no
Spending time in nature, recreation, tourism	yes	yes	yes	yes	yes	yes

Habitats / Services	sandy steppes	petrophitic steppes on silicate substrates	petrophitic steppes on carbonate substrates	meadow steppes	true steppes	desert steppes
Opportunity for scientific study of biodiversity and natural processes	yes	yes	yes	yes	yes	yes
Opportunity for experiential education	yes	yes	yes	yes	yes	yes
Opportunity for raising children in contact with nature / Experience	yes	yes	yes	yes	yes	yes
Source of artistic inspiration and ideas	yes	yes	yes	yes	yes	yes
Social cohesion, patriotic symbols	yes	yes	yes	yes	yes	yes
Religious symbols, shrines, totemic and sacred animals or trees	no	no	no	no	no	no
Opportunity to study and document nature in its authentic form (nature films, photography, collections, herbariums)	yes	yes	yes	yes	yes	yes
Formation of identity of ethnic and social groups based on landscape diversity, natural conditions, and nature use; shaping the concept of the "Homeland"	yes	yes	yes	yes	yes	yes
Social functions of wild nature use (hunting, fishing, etc.)	yes	yes	yes	yes	yes	yes
Total	**28**	**28**	**28**	**35**	**35**	**30**

5. STATUS

5.1. CRITERIA FOR FAVORABLE CONSERVATION STATUS

Sandy steppes

- presence of rare and endangered species, especially those with a continental distribution range;
- absence of nutrient-demanding and mesophilous species;
- low grass cover density;
- significant role of lichens and mosses in vegetation cover;
- absence of alien species;
- absence of trees and shrubs;
- large spatial extent of habitat patches.

Petrophytic steppes on silicate substrates

- presence of endemic, rare species or species with isolated locations disconnected from their main range;
- absence of signs of mesophilous species spread or high vegetation cover density;
- absence of signs of encroachment by trees and shrubs

Petrophytic steppes on carbonate substrates

■ vegetation is sparse and low-growing;
■ high percentage of exposed bedrock;
■ absence of nutrient-demanding and ruderal species;
■ chamaephytes dominate the plant communities;
■ presence of rare and endangered species, as well as endemic plant species;
■ habitats are confined to sun-exposed slopes, supporting light-demanding species.

Meadow steppes

■ high species richness;
■ absence of nitrophilous and ruderal species;
■ long-term habitat stability;
■ high vegetation cover density;
■ traditional grazing/haymaking regime;
■ low cover of tall grasses uncharacteristic of this habitat type, as well as of shrubs and trees.

True steppes

In its natural state, this habitat type is characterised by high species richness, with a clear dominance of steppe tussock grasses. The following characteristics may be considered indicators of favourable condition; however, these indicators may vary across regions depending on origin, geographical location, and the level of anthropogenic transformation:

■ high species richness;
■ presence of rare and/or threatened endemic plant species;
■ low cover and proportion of non-characteristic shrub and tree species;
■ absence of invasive species.

Desert steppes

■ relatively low species richness, but with a significant proportion of plants with a continental distribution;
■ low vegetation cover within communities;
■ presence of rare and/or threatened species;
■ a high proportion of slow-growing, salt-tolerant chamaephytes;
■ absence of invasive and ruderal species.

5.2. HABITAT CONDITION ASSESSMENT

The assessment of the degree of threat impact, conservation significance, and loss risks was carried out using the original methodology by Y.P. Didukh[17] (Table 5.2.1). The evaluation of habitats regarding compliance with IUCN criteria was performed according to the methodology of the European Red List of Habitats[18] (Table 5.2.2).

Based on the results of the comprehensive assessment, it was established that the vast majority of steppe habitats belong to Category II, while sandy steppes, in terms of resilience and loss risk, belong to the highest Category I. According to the original methodology, habitats of Classes I and II have high conservation value, limited distribution, low regeneration capacity, sensitivity to anthropogenic impacts, high risk of loss, and require specific targeted conservation measures. According to the ecosystem services assessment, they fall into the category of "scientific-informative" and all their locations should have the appropriate protected status.

Based on the assessment according to IUCN criteria, sandy, meadow, and desert steppes have been classified as Endangered (EN)**;** true steppes as Critically Endangered (CR)**;** and petrophytic steppes as Vulnerable (VU)**.**

Table 5.2.1. Assessment of Threat Impact, Conservation Significance, and Loss Risks of Grassland Habitats in Ukraine

[17] Didukh Y.P., Kuzemko A.A., Vakarenko L.P. Assessment of the significance and cadastre of rare habitats of Ukraine for biodiversity conservation and environmental monitoring. Vegetation and habitat classification of Ukraine: materials of the third scientific-theoretical conference, Kyiv, April 19–21, 2018. Kyiv, 2018. pp. 6–36.

[18] Janssen J.A.M., Rodwell J.S., García Criado M., et al. European Red List of Habitats – Part 2. Terrestrial and freshwater habitats. Luxembourg: Publications Office of the European Union, 2016. 44 p.

Ukrainian Name of the Habitat	Categories of Threat Impact Assessment *				Total Threat Assessment Score	Degree of stability	Stability Class	Categories of Conservation Significance **										Sum of Scores of Conservation Value	Habitat Value, %	Habitat Value Class	Habitat Loss Risk Assessment	Habitat Loss Risk Class
	a	b	c	d				e	f	g	h	i	j	k	l	m	n					
Sandy steppes	4	4	3	3	14	83	I	3	3	3	3	3	4	3	3	4	4	33	77	II		I
Petrophyte steppes	3	3	2	4	12	67	II	4	3	3	3	3	4	3	3	4	4	34	80	II		II
Meadow steppes	3	4	3	3	13	75	II	3	3	3	3	3	3	3	3	3	4	31	70	II		II
True steppes	3	4	3	3	13	75	II	3	3	3	2	2	3	3	3	4	4	30	67	II		II
Desert steppes	3	4	3	2	12	67	II	3	3	3	2	2	3	3	4	3	4	30	67	II		II

*a – outcome of threat impacts, b – spatial extent of negative impact on the habitat, **c** – intensity of adverse external factors, d – degree and rate of recovery (plastic and dynamic resilience); **e – position in the successional series, f – regional representativeness, g – distribution pattern, h – ecological amplitude, i – ecological and coenotic conditions of distribution, j – presence of invasive species, k – degree of hemeroby, l – ratio of life strategy types (K/R): k – patients, violents or stress-tolerants, R – exploiters or ruderals, m – conservation significance, n – synphytosozological status.

Table 5.2.2. Assessment of Grassland Habitats of Ukraine According to IUCN Criteria

Group of habitats	Integrated assessment *	Criteria of the European Red List of Habitats*										
		A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	E
Sandy steppes	EN	EN	EN	EN	EN	VU	VU	VU	EN	EN	EN	EN
Petrophytic steppes	VU	VU	VU	VU	DD	NT	VU	NT	VU	VU	VU	LC
Meadow steppes	EN	VU	VU	VU	DD	NT	NT	NT	VU	EN	EN	DD
True steppes	CR	VU	CR	CR	CR	LC	LC	LC	VU	EN	EN	EN
Desert steppes	EN	VU	EN	VU	VU	VU	VU	LC	VU	VU	VU	VU

*A – Size decline, B – Restricted geographic distribution, C/D – Quality decline, C – Decline in the quality of abiotic components, D – Decline in the quality of biotic components, E – Quantitative analysis. A detailed description of the criteria is provided in the Ukrainian translation in the Atlas of Grassland Habitats of Ukraine. IUCN categories: Critically Endangered (CR); Endangered (EN); Vulnerable (VU).

5.3. PRESENCE OF STEPPE HABITATS WITHIN UKRAINE'S PROTECTED AREAS

Steppe ecosystems in Ukraine are protected within two Biosphere Reserves (Askania-Nova and Black Sea Biosphere Reserves), 30 National Nature Parks – the largest areas of such habitats are found within Kamianska Sich, Azovo-Syvaskyi, Biloberezhzhia Sviatoslava, Buzkyi Gard, Dvorichanskyi, Dzharylhatskyi, Kuyalnytskyi, Meotyda, Oleshky Sands, Podilski Tovtry, Pryazovskyi, Sviati Hory and Charivna Havan National Nature Parks, and 12 nature reserves, of which the Luhansk, Ukrainian Steppe, Yelanetsky Steppe, and Mykhailivska Tsilyna Reserves were established specifically for the conservation of steppe ecosystems. Steppe habitats are also protected within many sites and objects of lower protection status (zakaznyks, protected tracts, natural monuments) of both national and local significance.
At present, a significant part of the protected areas conserving steppe habitats is located within zones of active hostilities or on temporarily occupied territories. These include Askania-Nova and Black Sea Biosphere Reserves; Kazantyp, Karadag, Crimean, Luhansk, Opuk, Cape Martyan, Ukrainian Steppe, and Yalta Mountain-Forest Nature Reserves; as well as Azovo-Syvaskyi, Velykyi Luh, Dvorichanskyi, Dzharylhatskyi, Meotyda, Lower Dnipro, Oleshky Sands, Pryazovskyi, Charivna Havan, Kamianska Sich, and Sviati Hory National Nature Parks

5.4. PRESENCE OF STEPPE HABITATS WITHIN EMERALD NETWORK SITES

At present, habitats of type E1.2 are recorded in 245 Emerald Network sites in Ukraine, covering a total area of 1,280,122.14 ha; this corresponds to approximately 2% of the country's territory.

However, the quality of the data underlying the reporting of this habitat type in the Standard Data Forms of Emerald Network sites is considered good for only 18% of sites. For 29% of sites, data quality is moderate, while more than half of the sites are characterised by insufficient data quality. It should also be noted that the representativity of these sites is assessed as excellent for more than two-thirds of Emerald Network sites, high for 16%, significant for 13%, and low for only 1% (Fig. 5.4.1). Accordingly, the conservation status is assessed as excellent in 56% of Emerald Network sites, good in 38%, and moderate in only 6% (Fig. 5.4.2).

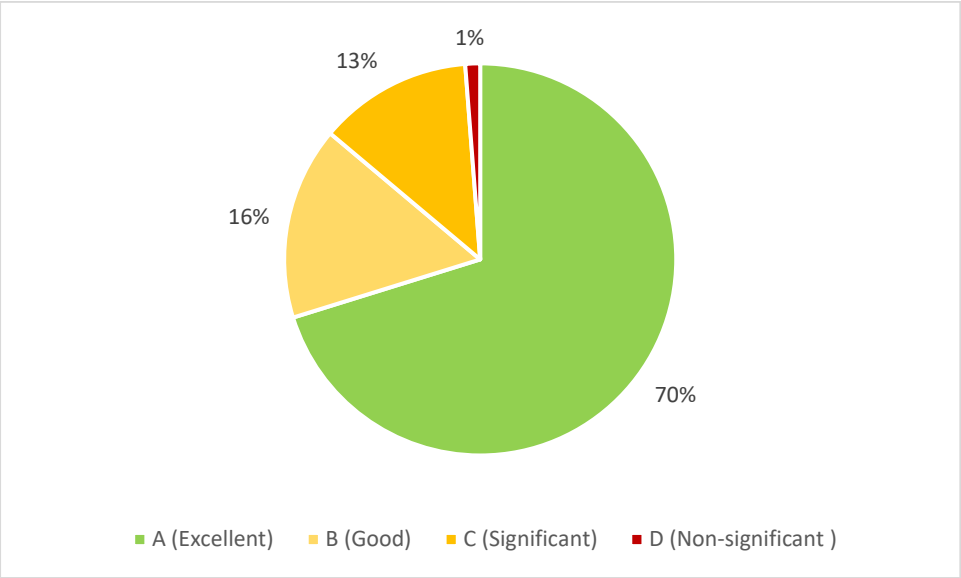


Fig. 5.4.1 Distribution of Emerald Network sites by representativity of habitat type E1.2.

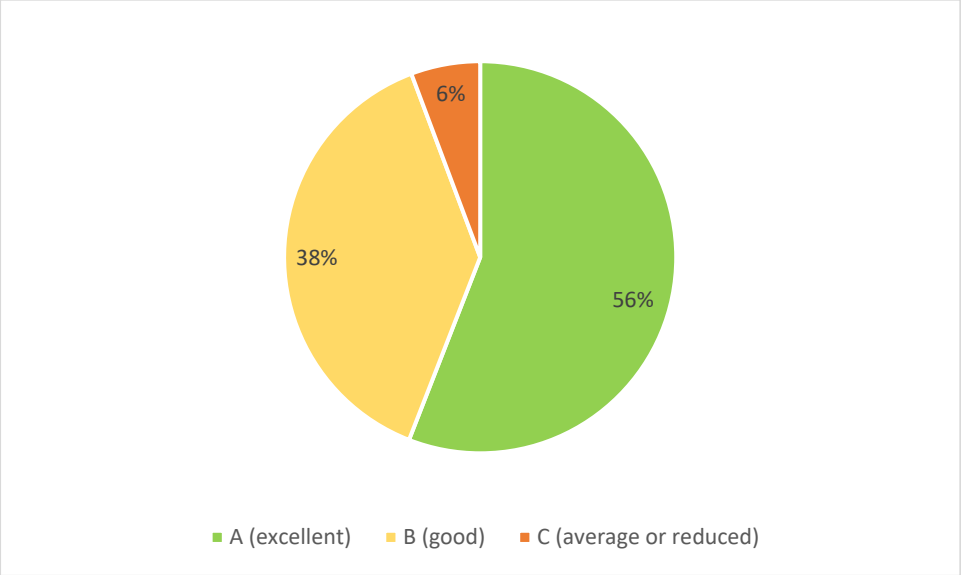


Fig. 5.4.2 Distribution of Emerald Network sites by conservation status of habitat type E1.2.

6. THREATS

According to the standard list of threats, pressures, and activities defined in the standard data form for Natura 2000 sites and Emerald Network[19] sites, steppe ecosystems are subject to a range of

[19] European Environment Agency. (2011). *Threats, Pressures, Activities (SDF field: 4.3): List of threats and pressures*. Retrieved June 7, 2025, from https://cdr.eionet.europa.eu/help/natura2000

impacts listed in Table 6.1 (with impact intensity indicated as: * – weak, ** – moderate, *** – strong).

Table 6.1. Threats to habitat E1.2 and their impact intensity

Code	Type of threat, pressure or activity	Impact intensity	Notes
A	**AGRICULTURE**		
A02	**modification of cultivation practices**		
A02.01	agricultural intensification	***	
A02.03	Conversion of grasslands to arable land	***	
A03	**mowing / cutting of grassland**		
A03.01	intensive mowing or intensification	*	
A03.03	abandonment / lack of mowing	***	
A04	**grazing**		
A04.01	intensive grazing	*	
A04.01.01	intensive cattle grazing	*	
A04.01.02	intensive sheep grazing	*	
A04.01.03	intensive horse grazing	*	
A04.01.04	intensive goat grazing	*	
A04.01.05	intensive mixed animal grazing	*	
A04.03	abandonment of pastoral systems, lack of grazing	***	
B	**SYLVICULTURE, FORESTRY**		
B01	**forest planting on open ground**		
B01.01	forest planting on open ground (native trees)	***	
B01.02	artificial planting on open ground (non-native trees)	***	
C	**MINING, EXTRACTION OF MATERIALS AND ENERGY PRODUCTION**		
C01	**Mining and quarrying**		
C01.01	Sand and gravel extraction	**	
C01.01.01	sand and gravel quarries	**	
C01.02	Loam and clay pits	*	
C01.04	Mines	**	
C01.04.01	open cast mining	**	
D	**TRANSPORTATION AND SERVICE CORRIDORS**		
D01	**Roads, paths and railroads**		
D01.01	paths, tracks, cycling tracks	*	
D01.02	roads, motorways	**	
D02	**Utility and service lines**		

Code	Type of threat, pressure or activity	Impact intensity	Notes
D02.01	electricity and phone lines	*	
D02.01.01	suspended electricity and phone lines	*	
D02.01.02	underground/submerged electricity and phone lines	*	
D02.02	pipe lines	*	
E	**URBANISATION, RESIDENTIAL AND COMMERCIAL DEVELOPMENT**		
E01	**Urbanised areas, human habitation**		
E01.01	continuous urbanisation	**	
E01.02	discontinuous urbanisation	*	
E01.03	dispersed habitation	*	
E01.04	other patterns of habitation	*	
E02	**Industrial or commercial areas**		
E02.01	factory	**	
E02.02	industrial stockage	**	
E03	**Discharges**		
E03.01	disposal of household / recreational facility waste	**	
E03.02	disposal of industrial waste	**	
E04	**Structures, buildings in the landscape**		
E04.01	Agricultural structures, buildings in the landscape	*	
E04.02	Military constructions and buildings in the landscape	***	Including dugouts, trenches, and fortifications
E05	**Storage of materials**	*	
E06	**Other urbanisation, industrial and similar activities**		
E06.01	demolishment of buildings & human structures	**	Including construction debris from destroyed buildings as a result of shelling and bombings
F	**BIOLOGICAL RESOURCE USE OTHER THAN AGRICULTURE & FORESTRY**		
F03	**Hunting and collection of wild animals (terrestrial)**		
F03.01	Hunting	*	
F03.02	Taking and removal of animals (terrestrial)	*	
F03.02.01	collection of animals (insects, reptiles, amphibians.....)	*	
F03.02.03	trapping, poisoning, poaching	*	

Code	Type of threat, pressure or activity	Impact intensity	Notes
F03.02.04	predator control	*	
F03.02.05	accidential capture	*	
F04	**Taking / Removal of terrestrial plants, general**		
F04.02	collection (fungi, lichen, berries etc.)	*	
F04.02.02	hand raking	*	
G	**HUMAN INTRUSIONS AND DISTURBANCES**		
G01	Outdoor sports and leisure activities, recreational activities		
G01.03	motorised vehicles	**	
G01.03.01	regular motorized driving	*	
G01.03.02	off-road motorized driving	**	Including the movement of heavy military equipment
G04	**Military use and civil unrest**		
G04.01	Military manouvres	*	
G05	**Other human intrusions and disturbances**		
G05.01	Trampling, overuse	**	Including demographic pressure caused by mass displacement of people
H	**POLLUTION**		
H04.02	Nitrogen-input	**	
H05	**Soil pollution and solid waste (excluding discharges)**	***	Mass contamination with fuel, heavy metals, explosives, ammunition, and military equipment as a result of warfare
H05.01	garbage and solid waste	*	
H06.02	Light pollution	*	
I	**INVASIVE, OTHER PROBLEMATIC SPECIES AND GENES**		
I01	**invasive non-native species**	***	
I02	**problematic native species / expansive native species**	*	
J	**NATURAL SYSTEM MODIFICATIONS**		
J01	fire and fire suppression		
J01.01	burning down	**	Including fires resulting from hostilities
J02	**human induced changes in hydraulic conditions**		
J02.05.04	reservoirs	**	
J03	**Other ecosystem modifications**		
J03.02	anthropogenic reduction of habitat connectivity	***	Including those caused by landmines and UXO (unexploded ordnance)
J03.02.01	reduction in migration/ migration barriers	***	

Code	Type of threat, pressure or activity	Impact intensity	Notes
J03.02.02	reduction in dispersal	***	
J03.02.03	reduction in genetic exchange	***	
K	**NATURAL BIOTIC AND ABIOTIC PROCESSES (WITHOUT CATASTROPHES)**		
K01	**abiotic (slow) natural processes**		
K01.01	Erosion	**	
K02	**Biocenotic evolution, succession**		
K02.01	species composition change (succession)	***	
K02.02	accumulation of organic material	***	
K04	Interspecific floral relations		
K04.04	lack of pollinating agents	**	
M	**CLIMATE CHANGE**		
M01	**Changes in abiotic conditions**		
M01.01	temperature changes (e.g. rise of temperature & extremes)	**	
M01.02	droughts and less precipitations	**	
M02.03	decline or extinction of species	**	

Based on the above assessment (Table 6.1.), it is evident that the greatest threats to steppe ecosystems at this stage are the intensification of agriculture and the ploughing of grassland habitats; the cessation of traditional haymaking and grazing use of steppe ecosystems, which leads to the accumulation of excessive phytomass and triggers natural succession, resulting in steppes being overgrown by trees and shrubs; and the creation of artificial forest plantations on former steppe ecosystems, including the use of non-native tree species.

A significant problem is also the spread of invasive alien species, as discussed in subsection 1.2.7. Complete ploughing of steppe ecosystems, residential development, and the construction of transport infrastructure cause extreme fragmentation of steppe ecosystems, creating barriers to migration and reducing dispersal, and thus limiting genetic exchange.

The classification of threats, pressures, and activities used does not include any references to the impact of armed conflicts and hostilities, since nature conservation legislation and EU regulatory documents were developed for a peaceful context and therefore cover only chronic, controllable, and predictable threats. War, however, is an emergency situation that falls outside this context. Currently, in Ukraine, the main new and possibly the most extensive threat to natural ecosystems of all types is the impact of war. Therefore, in the Action Plan, we add clarifications in the notes that existing points specifically relate to war-related activities.

Identifying the main threats to steppe habitats at the local level within protected areas is an integral part of situational analysis and must be carried out with the involvement of all stakeholders within the management planning process. The strength of the impact and root causes of these threats must be determined[20].

7. CONSERVATION OBJECTIVES

7.1. STRATEGIC OBJECTIVES

The provisions of the Habitats Directive stipulate the need to establish and implement conservation measures that ensure or restore a favourable conservation status for natural habitat types and species of Community interest, i.e. those listed in the Annexes of the Directive. In accordance with the Habitats Directive, the conservation status of a natural habitat is considered favourable when:

- its natural range and the areas it covers are stable or increasing;
- the structure and functions necessary for its long-term maintenance are present and are likely to continue to exist in the foreseeable future;
- the conservation status of its typical species is favourable.

The Directive also provides for the establishment of a coherent European ecological network of Special Areas of Conservation, known as Natura 2000. This network consists of sites hosting the natural habitat types listed in Annex I, as well as the habitats of plant species listed in Annex II. Its objective is to enable the maintenance or, where appropriate, the restoration of a favourable conservation status of natural habitat types and species within their natural ranges.

Strategic Objectives at the National Level

1. Mapping and Monitoring. The primary objective of the Action Plan should be to determine the current distribution of steppe habitats, which is only possible through habitat mapping both within protected areas and across biogeographical regions and the country as a whole. This will establish a baseline for subsequent monitoring, enabling the detection of changes in habitat extent and condition, and thereby allowing for the assessment of the effectiveness of all measures included in the Plan.

2. **Maintaining the existing range** of the habitats involves preventing any potential losses through the implementation of appropriate management across its entire territory. Increasing the area occupied by the habitat implies compensating for past losses and is especially important in cases where, due to historical reduction, only isolated patches of small size remain. This will require restoration of the habitat in suitable locations while simultaneously preventing a decrease in the

[20] Conservation Measures Partnership (CMP). (2020). *Open Standards for the Practice of Conservation* (Version 4.0). 96 pp.

total area of the habitat and the number of localities. Appropriate areas for restoration should be selected considering the biogeographical context and the need to ensure the long-term conservation of the natural habitat type and associated species, its ecological diversity, and the maintenance of connectivity within its natural range.

3. Improvement of Structure and Functions. The structure and functions of a habitat relate to its species composition and diversity, ecological functions and processes characteristic of the habitat, as well as ecological connections. Improvement of these characteristics may be necessary in degraded areas. This requires restoration measures and prevention of further degradation by eliminating or minimizing the impact of threats and pressures affecting the natural habitat. Enhancing the structure and functions of the habitat also requires analysis of the diversity and distribution of plant communities and species typical for the natural habitat at the national level. Connectivity is also important for the conservation of steppe habitats. Local increases in the size of patches as part of a functioning network are necessary to ensure the long-term viability of the habitat, taking into account its high fragmentation.

4. Improvement of Prospects requires identifying the root causes of the main threats and pressures on the habitat in order to improve the trends of various parameters. For example, it is necessary to stop the expansion of shrubs and invasive species, prevent the cessation of traditional land use, and so on.

5. Raising Awareness of the Importance of Steppe Ecosystems. In addition to the above-mentioned objectives related to the conservation management of steppe ecosystems, it is extremely important to communicate and convey to society (managers, stakeholders, and the general public) the ecological value of steppes. Beyond biodiversity values, it is important to emphasize other aspects, especially those related to ecosystem services.

Thus, the objective of this Action Plan is to ensure a favourable conservation status of the natural habitat type E1.2 throughout the territory of Ukraine in the medium and long-term.

Strategic Objectives at the Local Level

Within Protected Areas

Strategic objectives at the local level should be established for all Emerald Network sites (as prospective Natura 2000 sites), as well as Biosphere and Nature Reserves, National Nature Parks, and, where possible, Regional Landscape Parks where steppe habitats are present. The purpose is to implement necessary conservation measures for habitat type E1.2 and species associated with it. These strategic objectives should be integrated into the management plan of the Emerald Network site or into the spatial organization project of the Biosphere Reserve, Nature Reserve, or National Nature Park.

Local-level strategic objectives must define the conditions that the habitat should achieve within the protected area to maximize its contribution to achieving a favourable conservation status of this habitat type in a given biogeographical region at the national level.

Setting local objectives requires an assessment of the relative importance of each protected area for the conservation of this habitat type and the current potential of each area for the habitat type, which involves establishing the following aspects:

- the importance of each protected area for achieving national-level objectives;
- the current status of the habitat in each protected area and its potential for restoration;
- the historical management of the territory that contributed to the maintenance of the habitat type, its changes, factors potentially causing habitat degradation, and possible long-term impacts.

When defining strategic objectives, the following aspects should also be considered:

- ecological requirements of the habitat in each specific protected area;
- threats and their root causes present in the territory that may affect the habitat;
- the situation in adjacent territories, including functional connections related to the use of the habitat that may influence the status of the habitat within the protected area;
- the role of the habitat and the ecosystem services it provides.

The established strategic objectives should meet the following requirements:

- be specific to each protected area (but may be supplemented by a broader set of national-level objectives);
- be comprehensive, i.e., address all species associated with the natural habitat type;
- clearly define the desired condition of the habitat and its associated species.

Setting Strategic Objectives and Management Approaches for a Specific Territory

Within individual protected areas, the setting of strategic objectives should form an integral part of management planning. In this context, the conservation status of steppe habitats should be assessed using clear quantitative criteria, such as area and the presence or abundance of typical or indicator species. Based on these indicators, status is evaluated on a four-point scale as “excellent”, “good”, “moderate”, or “poor”.

If, based on a comprehensive assessment, a habitat is determined to be in excellent condition, strategic objectives should aim to maintain this status, i.e. to prevent any reduction in habitat area and in the number of typical and indicator species that define its appropriate structure and functioning. If the habitat condition is assessed as good, moderate, or poor, strategic objectives should aim at its improvement, i.e. increasing the area and/or the number of indicator and typical

species. This can be achieved through properly designed management of steppe ecosystems, which is addressed in the following section.

According to the Habitats Directive, “excellent” and “good” habitat conditions correspond to a “favourable” conservation status, under which:

- the natural range and the areas occupied by the habitat within that range are stable or increasing;
- the structure and functions necessary for its long-term conservation are present and are likely to continue to exist in the foreseeable future;
- the conservation status of its typical species is favourable.

8. CONSERVATION AND RESTORATION MEASURES

8.1. INVENTORY OF THE BIOTOPE (HABITAT TYPE) E1.2 PERENNIAL CALCAREOUS GRASSLANDS AND BASIC STEPPES ON PROTECTED AREAS, INCLUDING EMERALD NETWORK SITES WITHIN ADMINISTRATIVE REGIONS

A necessary condition for the inventory of steppe habitats is their mapping both within protected areas and across the entire country. Currently, the mapping of steppe habitats within protected areas is carried out fragmentarily and for various purposes. For example, a habitat map was developed for the Emerald Network site “UA0000077 Pyriatynskyi National Nature Park” as part of the Management Plan for this area[21]. For the Kamianska Sich National Nature Park, a habitat map was created to assess the damage caused by military actions resulting from the armed aggression of the russian federation[22]. For the Askania-Nova Biosphere Reserve, a habitat map was produced to document the pre-occupation state of the habitats[23].

The main method of habitat mapping is field mapping, the methodology of which is set out in the National Habitat Catalogue of Ukraine[24]. This method was applied in the pilot project for habitat mapping of the Emerald Network site “UA0000077 Pyriatynskyi National Nature Park”. It involves completing a specific form for each polygon and therefore provides the most accurate results; however, it requires significant effort and time. A less resource-intensive approach is the combined method of habitat mapping, which involves identifying habitats using remote methods – such as

[21] https://daphne.sk/pyrmp/#

[22] Khodosovtsev, O.Ye., Moysiyenko, I.I., Kuzemko, A.A., et al. (2025). National Nature Park “Kamianska Sich”: War Against Nature. Lviv: Manuscript Company Publishing. 184 p.

[23] Prylutsky O.V., Shapoval V.V., Kuzemko A.A. Pre-occupation State of Habitats in the Askania-Nova Biosphere Reserve: Inventory and Mapping Using Machine Learning and Remote Sensing Methods. Bulletin of the Askania-Nova Biosphere Reserve, No. 26, 2024, pp. 68–85.

[24] Lasak R., Sheffer J., Kuzemko A. (2018). Methodology of Field Habitat Mapping. In A. A. Kuzemko, Y. P. Didukh, V. A. Onyshchenko, & J. Šeffer (Eds.), National Habitat Catalogue of Ukraine (pp. 411–428). FOP Klymenko Yu. Ya.

satellite imagery analysis, cartographic materials, phytosociological data, or expert knowledge – and mapping only those polygons that cannot be identified in this way through field surveys. This approach was applied for the development of spatial organisation projects for protected areas in the Carpathian region[25, 26]. Modern information technologies using remote sensing methods, particularly those involving machine learning and neural networks, enable fully remote habitat mapping. This is especially relevant for areas located in zones of active hostilities or temporarily occupied by the russian federation[21].

The choice of mapping method should depend on the available resources and the accessibility of the area for survey.

Mapping results make it possible to determine the exact area occupied by a specific habitat type, assess its representativity and condition, and use this information as a baseline for future monitoring.

These methods allow not only for large- and medium-scale mapping, but can also be applied to habitat mapping at the level of administrative regions and the entire country, as has been done in many EU Member States – for example, the Czech Republic[27]. Such mapping can serve as a basis for developing a Habitat Cadastre of Ukraine, which in turn provides valuable factual material for conducting Environmental Impact Assessments (EIA), Strategic Environmental Assessments (SEA), and can help safeguard valuable steppe habitats from the adverse effects of economic activities.

In order to plan the management of steppe habitats, it is necessary to assess how representative they are and what their conservation status is.

Representativity is assessed according to the recommendations for completing the Standard Data Form for Natura 2000 sites[28]. The degree of representativity is a measure of how typical a given habitat type is. This is particularly important in terms of the correspondence between the target steppe habitats and the description of type E1.2 in Resolution No. 4 of the Bern Convention, or subordinate types listed in Annex I of the Habitats Directive, based on their definition in the relevant interpretation manuals, which can be considered as a standard of typicality.

[25] https://ukraine.fzs.org/project/plany-upravlinnya/

[26] Kuzemko A.A., Borsukevych L.M., Harbar O., Kish R.Ya., Moisiienko I.I., Mochan V.I., Strus Yu.M., Chorney I.I. Experience in Habitat Mapping for the Development of Management Plans (Based on the Example of Protected Areas of the Ukrainian Carpathians). Vegetation and Habitats of Ukraine: Proceedings of the Fifth Scientific and Practical Conference (Kyiv, April 18-19, 2024) / Edited by Acad. Y.P. Didukh, NAS of Ukraine. – Kyiv, 2024. – p. 9.

[27] Agentura ochrany přírody a krajiny ČR. (2020). *Habitat Mapping Application of the Czech Republic* [Web map application]. Retrieved June 20, 2025, from https://aopkcr.maps.arcgis.com/apps/webappviewer/index.html?id=c38db59779714a78aec4c731152b0290

[28] Commission Implementing Decision of 11 July 2011 concerning a site information format for Natura 2000 sites (notified under document C(2011) 4892) (2011/484/EU). Official Journal of the European Union 30.7.2011. L 198/39–70.

According to the recommendations, such an assessment can be made for individual protected areas, for Natura 2000 and Emerald Network sites, for groups of such sites, or for the country as a whole. Representativeness is assessed according to three categories: A – highest representativeness; B – high representativeness; C – significant representativeness.

The degree of conservation is assessed similarly to the previous indicator; however, this criterion comprises three components: the degree of conservation of structure (I – highest, II – high, III – moderate or partially degraded structure); the degree of conservation of function, or the capacity to maintain structure in the future (I – best prospects, II – good prospects, III – moderate or poor prospects); and restoration potential (I – easy to restore, II – restoration possible with moderate effort, III – difficult or impossible to restore).

The degree of conservation is an integrated assessment based on the three components: A – highest degree of conservation (either: the highest degree of structural conservation regardless of the assessment of the other two components; or: a high degree of structural conservation combined with the best prospects for future conservation, regardless of the third component's assessment); B – high degree of conservation (either: a high degree of structural conservation and good prospects, regardless of the third component; or: a high degree of structural conservation, moderate or poor prospects, and easy or moderately feasible restoration; or: moderate or partially degraded structure, best prospects, and easy or moderately feasible restoration; or: moderate or partially degraded structure, good prospects, and easy restoration); C – moderate or low degree of conservation (all other combinations).

Based on the results of this assessment, decisions are made regarding the feasibility of applying conservation and restoration measures for the habitat.

8.2. DEVELOPMENT OF RECOMMENDATIONS FOR THE MANAGEMENT OF BIOTOPE (HABITAT TYPE) E1.2 PERENNIAL CALCAREOUS GRASSLANDS AND BASIC STEPPES IN PROTECTED AREAS AND EMERALD NETWORK SITES

Steppe ecosystems are incomplete, as they lack wild herbivores that would remove excess phytomass. Without this key component, biomass accumulates, leading to mesophytisation followed by the degradation of steppe ecosystems and their overgrowth by trees and shrubs. As a result, such ecosystems become imbalanced and require extensive management across their entire range in order to prevent natural succession and the transformation of steppes into woody and shrub-dominated vegetation. The main management measures for these ecosystems should include livestock grazing, mowing, and controlled burning. In general, measures that mimic natural processes (i.e. the removal of part of the biomass), as well as traditional management practices that prevent tree encroachment and support the restoration of steppe communities, are appropriate for maintaining this habitat in good condition. Depending on local conditions, the measures described below may be necessary or beneficial.

8.2.1 GRAZING

The traditional use of steppe ecosystems is grazing and hay mowing, or a combination of both. In rural areas, grazing has both economic importance and serves as a conservation measure that helps maintain the landscape's aesthetic value and benefits the local community. Steppe habitats are generally low-productivity systems that yield low amounts of forage grasses, so they are usually maintained through grazing rather than mowing. Except in cases of very high livestock density, grazing removes plant material more gradually than mowing. This allows more mobile invertebrates to move to other parts of the steppe. Grazing animals also contribute to nutrient cycling within the grassland habitat ecosystem.

Options for establishing an appropriate grazing regime to conserve biodiversity are determined by the following parameters:

- type of livestock (cattle, sheep, horses, goats, etc.)
- grazing periods (grazing season)
- stocking density
- duration of grazing (the time during which livestock are allowed to graze per unit area)
- grazing system (the sequence and pattern of grazing).

The structure of grassland habitats is maintained through grazing by various types of animals: cattle, horses, sheep, goats, and ponies. In certain protected areas (Askania-Nova Biosphere Reserve, Yelanetsky Steppe Nature Reserve), introduced populations of wild ungulates may also be grazed, such as bison, kulan, saiga antelope, Przewalski's horses, and others.

Cattle generally create and maintain more structurally diverse communities in meadow steppes better than sheep. Very dry steppe pastures are usually more suitable for sheep grazing, as they tolerate extreme conditions better. Areas grazed by horses and ponies can have diverse structure and support unusually high invertebrate diversity due to the mosaic effect created during grazing.

Cattle differ significantly from sheep in that they prefer taller grasses and cannot graze as selectively. Goats may browse leaves and shoots on trees and shrubs, thereby helping to prevent the invasion of woody plants into steppe habitats. Donkeys, like ponies, graze selectively.

The trampling effect also varies depending on the type of animal. The physical pressure exerted on grassland habitat by sheep is estimated at 0.8–0.95 kg/cm, while by cattle it is 1.2-1.6 kg/cm[29].

Grazing period**.** Grazing on pastures can occur at any time of the year, including periods of plant growth, flowering, or seed ripening. However, in the absence of summer grazing, plants and animals may complete their life cycles without experiencing the impact of large herbivores. Therefore, if grazing is conducted for conservation purposes, its start can be postponed until after

[29] *Spedding C.R.W. 1971. Grassland ecology. Oxford: Oxford University Press.*

the end of the growing season. Spring and summer grazing may hinder seed production, while winter grazing can cause soil damage by hooves. This also reduces structural diversity and decreases habitats for flower-dwelling invertebrates (during flowering, steppe habitats provide an excellent source of nectar and pollen for many insects), which may negatively affect invertebrate populations. Winter grazing causes less harm to invertebrates, which typically overwinter at the base of grass tussocks. Moderate trampling breaks up the litter layer, exposing soil for colonization by annual plants in the following spring. Moreover, winter grazing can benefit invertebrates by creating patches of bare soil through trampling, which provides conditions for the emergence of new microhabitats. Winter grazing may be more effective for maintaining low-productivity grassland habitats where excess biomass is not excessive.

Grazing intensity. Grazing intensity is a measure of the amount of vegetation that a certain number of animals of a given species and size, while grazing, can consume from a grassland habitat during the time they spend there. When grazing pressure exceeds the carrying capacity of the pasture, it typically leads to damage to the ecological and productive properties of the sward.

The number of grazing animals and the duration of their stay on a site determine the outcome of the grazing regime as a conservation measure. The essence of managing a pasture system is to ensure that by the beginning of the next growing season, all the annual biomass production has been removed. The annual yield of plant biomass sets the upper limit of grazing pressure that a particular sward can tolerate. Conservation objectives usually require a grazing pressure level below the carrying capacity of the grassland habitat. This allows a significant portion of the annual biomass growth to escape grazing, so it can enter other food chains (e.g., herbivorous invertebrates or decomposer communities) or increase the structural diversity of the habitat. To achieve this, stocking density must be substantially reduced from the theoretical carrying capacity of the sward to ensure that a sufficient amount of vegetation remains ungrazed during the growing season to meet conservation goals. In small-area habitats, it can be especially challenging to achieve a balance in grazing intensity that prevents both shrub encroachment and overgrazing.

Duration of grazing. From the perspective of grass cover capacity, potential stocking levels are higher in summer than in winter because vegetation continues to regenerate during grazing in summer, whereas in winter biomass production ceases. However, this does not apply to the driest regions, where plants do not grow in summer and thus the carrying capacity is lower. Short periods of intensive grazing may be appropriate in situations with problematic weed species. However, the impact of short periods of intensive grazing on grassland habitats overall can be detrimental to some invertebrate species that depend on the continuity of the grassland structure throughout their life cycle. It is least harmful in winter, when most terrestrial insects are in a dormant phase. The same annual grazing pressure can be achieved by using lower stocking density, but only if it is maintained over a longer period.

Grazing system is the sequence of actions carried out to move livestock across the pasture area. There are two main strategies: continuous (stationary) grazing and rotational grazing, which can be

combined. At low stocking densities, continuous grazing allows ungrazed parts of the vegetation to develop phenologically, thereby providing many more ecological niches for animals to use (flowers, seeds, litter). Maintaining low stocking density can help control invasive plant species while preserving the invertebrate fauna that depends on the grassland.

Stocking density can be adjusted as needed. Where grazing or trampling threatens particularly valuable plant species, it may be necessary to establish special areas to protect these species from grazing impact. Fenced-off plots can improve the composition and quality of the grassland habitat, promoting the growth of rare and endangered plants characteristic of that habitat[30].

Extensive grazing contributes to reducing the average height of the sward, increasing mosaicism and species diversity, particularly by encouraging the presence of plants with long life cycles or annual species, suppressing expansive grasses (e.g., *Arrhenatherum elatius*, *Brachypodium pinnatum*), and limiting the expansion of nitrophilous species, except in resting areas. Moreover, it has little impact on the microfauna.

A grazing system in which the pasture area is divided into sections (fields, paddocks, or strips) or where a flock or herd is actively managed by a herder and livestock are moved to new pastures at regular intervals is called rotational grazing. Rotational grazing can be used to achieve conservation management goals, especially when areas with low sward height are needed to support more specialized communities dependent on them, and when the grassland habitat is scattered across many separate patches. This approach often works best in areas requiring winter grazing, as the objective is for animals to remove as much sward growth as possible from previous seasons.

For livestock keeping and creating multiple zones for rotational grazing, livestock fencing is suitable. The type of fencing (e.g., barbed wire, wooden fence, gate type, electric fence, etc.) should be agreed upon with the herders. Low-voltage electric fences powered by solar panels are easy to manage, relatively inexpensive, and allow the use of environmentally friendly energy.

When selecting the type of livestock, timing, intensity, duration, and grazing system, the specific conditions of the site where management measures are planned should be taken into account. Additionally, these parameters significantly depend on the type of steppe habitat[31].

For low-productivity **sandy steppes**, grazing is not recommended if these areas are sufficiently large and not eutrophicated, as in some parts of the Lower Dnipro sands; they can remain more or less stable for a considerable time without grazing. Optimal management for **petrophyte steppes** involves sporadic grazing by goats or mixed herds. An important prerequisite for creating favorable conditions for the conservation of rare species is sufficient habitat area and connectivity. **Meadow steppes** have traditionally been used mainly as hay meadows cut once per season, with grazing

[30] *European Commission. (2008).* Management of Natura 2000 habitats: 6210 Semi-natural dry grasslands (Festuco-Brometalia). Technical Report 2008 12/24. *Luxembourg: European Commission.*

[31] Management Models for the Maintenance, Conservation, and Restoration of Specific Types of Non-Forest Habitats. Edited by V. Shefferova, M. Plasman-Chernaya, R. Kish. — Kyiv: FOP Klymenko Y.Y., 2018. — 52 pages.

applied in autumn aftermath growth. Less commonly, they were maintained as extensive pastures. Meadows generally have lower biomass production. For such habitats, one-time spring grazing is recommended, with possible autumn grazing aftermath. Optimal grazing is by mixed herds of sheep, goats, and cattle, with herd size directly proportional to the grazing duration.

For **true steppes**, the optimal management regime is regular grazing of sheep and goats during the period from April to June. A mixed-species herd is more preferable than a herd consisting of only one species. The recommended ratio of sheep to goats is 3:1. Sheep graze selectively, focusing on the lower parts of grass cover, primarily on soft, non-flowering grasses that are grazed at a low height (less than 3 cm), resulting in consistent biomass removal. Goats prefer to graze plants at greater heights, especially flowering grasses, as well as tree leaves and bark, thereby limiting their growth.

For desert steppes the optimal usage regime is low-intensity sheep grazing.

Under current conditions in Ukraine, where traditional extensive use of natural pastures is in decline and livestock numbers are decreasing catastrophically, organizing grazing is extremely difficult – both within protected areas and on steppe pastures owned by local communities. The main reasons for this are the lack of government support for traditional management of natural pastures, low purchase prices for dairy products, urbanization, and other factors. These aspects must be taken into account in management planning. Addressing these issues may be facilitated by cooperation between protected area administrations and local communities, farmers, and entrepreneurs who can use the sites for grazing without the need for land withdrawal. In turn, protected area administrations – especially their environmental education departments – can help increase demand for local products among tourists and park visitors. In addition, grazing of steppe areas can be organized using wild ungulates, including through rewilding projects.

8.2.2.MOVING

Like grazing, mowing prevents the dominance of powerful competitive cereals and herbs, as well as the development of woody and shrubby vegetation. Maintaining greater structural diversity in grassland habitats may be necessary for the conservation of certain assemblages or rare invertebrate species[32]. Mowing does not create the same mosaic of microhabitats as grazing. Hayfields have limited structural diversity and are therefore of lower value to invertebrates compared to pastures.

Mowing can be differentiated by:

- timing;
- frequency;

[32] *Kirby P. 1992. Habitat management for invertebrates: a practical handbook. Sandy: Royal Society for the Protection of Birds.*

- distribution;
- methods.

Mowing Timing. The management of steppe habitats for conservation purposes usually involves a single late cut for hay. The exact dates may vary significantly depending on location and the features of conservation interest.

Late mowing can be beneficial:

- to protect animal species that require well-structured vegetation for foraging and shelter, particularly birds and insects;
- to allow late-flowering plants to set seed.
- Early mowing can be beneficial:
- in areas with dense vegetation, which would otherwise begin to decompose in the absence of intervention;
- to slow down the spread of invasive species.

Regular early mowing leads to a decline in the species diversity of steppes. Mowing should not take place until after the chicks of ground-nesting birds have fledged or until populations of “desirable” characteristic plant species that rely on seed formation for regeneration have set seed. Additionally, occasional late mowing (end of August/September), for example once every five years, is appropriate on plots where late-flowering species grow.

Meadow and true steppes are usually mown once a year, or sometimes once every two years due to their low productivity. More than one cut per year may be needed to simulate the former grazing regime where actual grazing cannot be implemented.

It is advisable to avoid mowing the entire area of a steppe plot at once. Instead, the timing of mowing should be staggered to prevent harm to the microfauna. Reptiles, insects, and spiders move very slowly, so it is important to leave unmown areas where they can take refuge. Spreading the mowing over time also extends the flowering phase of plants and the availability of nectar and pollen. For this reason, it is recommended to exclude a small portion (approximately 5–10%) of the total area from mowing each year and mow it the following summer. This should be done each year on a different part of the site, rotating so that any given area is left unmown once every 4–6 years.

Where possible, it is preferable to use bar mowers (sickle bar mowers). Rotary mowers cause significantly more animal mortality, so when using them, mowing should proceed from the center of the plot outward to allow animals to escape.

Very low cutting heights should be avoided, as there is a risk of excessive “scalping,” which creates bare patches and favors the invasion of undesirable species. If the vegetation is mown but the hay

is not intended for winter fodder – or if mowing is carried out solely for conservation purposes – the cut material should generally be removed to avoid nutrient enrichment of the habitat.

As with grazing, conservation mowing should be planned according to the habitat type, region, equipment availability, terrain features, and other local conditions.

Mowing is generally applied only to areas of meadow and true steppes. It is not used in sandy and desert steppes due to the low hay yield and short vegetation height, and in petrophytic steppe areas it is usually not feasible due to terrain features. Just like grazing, mowing is currently uncommon due to low profitability and lack of demand for hay. However, it is easier to organise on protected areas than grazing.

8.2.3. SHRUB REMOVAL

Abandoned steppe habitats (those that are neither grazed nor mown) may become overgrown with various shrub species, transforming into shrubland habitats (e.g. type F3.241 Central European subcontinental scrub and F3.247 Pontic-Sarmatic deciduous scrub). Although some species generally referred to as "shrubs" are considered invasive in steppe habitats and their control requires significant effort and resources, they are also important habitats in their own right – as long as a balance with open areas is maintained. Management measures should aim to keep shrub encroachment below 20% of the total area.

Problematic species typically include *Crataegus monogyna* (hawthorn), *Prunus spinosa* (blackthorn), *Ligustrum vulgare* (privet), *Viburnum lantana* (wayfaring tree), *Cornus sanguinea* (common dogwood), *Caragana frutex* (Siberian peashrub), and others. These types of shrubs are of low conservation value, as they are widespread, have low species richness, and regenerate easily. However, decisions about their removal should be made on a case-by-case basis for each site. Other shrub species such as *Prunus tenella* (dwarf almond), *Caragana scythica* (Scythian peashrub), *Prunus fruticosa* (steppe cherry), etc., are of conservation interest as they are either rare species themselves or provide habitat for rare fauna.

After the removal of trees and shrubs, many produce numerous root and stump shoots that should be removed. In some cases, this needs to be done only once, after which grazing or mowing can continue. In other cases, additional follow-up measures such as pruning with machinery, mulching, or tilling may be necessary in the first few years. Where shrubs begin to regrow, seedlings should be removed immediately, as well-established thickets are more difficult to eradicate. The following spring, sites should be checked for young shrubs and weeded manually or removed mechanically if needed.

Some shrub species – particularly blackthorn, dogwood, etc. – are difficult to remove, as they readily resprout after cutting. If there are no limiting factors (such as difficult access, specific landscape features, or the presence of rare species), old or undesirable shrubs can be uprooted using an excavator. This method allows for the removal of shrubs together with their root systems

and the nutrient-enriched topsoil, exposing the mineral soil and restarting natural succession. Excavators should not be used in areas where there is a risk of harming wildlife objects; in such cases, shrubs should be cut instead. Stumps are important for wildlife species, particularly fungi and insects, and should generally be left in place – except where they produce resprouts or where access or maintenance (e.g., mowing) requires their removal. In such cases, stumps can be treated with herbicides – either by targeted application to each stump or by applying herbicide to young regrowth (the "weed-wiping" method – a form of localized, selective herbicide application via direct contact with the unwanted plant), followed by livestock grazing.

Shrub clearance is carried out in autumn or winter to avoid harming wildlife during the reproductive period. Cutting between early September and the end of February avoids the bird breeding season, while late winter clearance allows birds and mammals time to feed on any remaining berries. Cutting can be done with specialised brush cutters that do not harm small fauna[28].

Rotational grazing can be an effective means of controlling shrubs if closely monitored to prevent overgrazing or trampling. Donkeys may strip shrub thickets, providing effective control of semi-natural vegetation. Cattle are particularly effective at pushing through and opening up tall shrub stands. Goats can strip bark and, if used carefully, create structural diversity. Sheep are less able to move through tall vegetation than cattle or ponies, but they are effective in low shrub habitats and can completely defoliate selected bushes. Additionally, some sheep breeds are good at penetrating dense scrub, though young animals and lightweight breeds may be prone to becoming trapped. It is therefore recommended to start with a low stocking rate for the given species and breed (around 0.25 animals/ha), monitor the outcomes, and adjust accordingly[17,21].

It should be noted that grazing alone is insufficient for shrub control. For example, a grazing regime based on winter grazing, typically needs to be complemented by regular shrub clearance to prevent the gradual expansion of woody vegetation.

8.2.4. CONTROL OF ALIEN SPECIES

In the context of this Action Plan, alien species are understood to mean those species that are undesirable in terms of achieving the management objectives for grassland habitats. Under certain conditions, some plant species (e.g. *Cirsium*, *Amaranthus*, *Ambrosia artemisiifolia*, etc.) can proliferate excessively, rapidly replacing assemblages of higher nature protection value. These plants are highly competitive, often toxic, and when they spread, they create dense shade during the growing season, hindering the establishment of other plant species. For this reason, such species should be removed at an early stage of development, when this requires relatively little effort and can produce good results. These species should be included in national lists of invasive alien species, and national strategies should be developed for their control.

Good management practices are the most important measure for preventing plant invasions. One such practice is the avoidance of large areas of bare soil caused by overgrazing, erosion,

ploughing, etc., which create opportunities for the invasion and spread of alien species. If the area is already colonised by alien species, the following measures can be applied:

- Manual control methods: digging out or hand-pulling target alien species slightly below ground level (applicable only in small areas), carried out immediately before flowering; hand-pulling should be repeated over several years and at different stages of the growing season to achieve the desired effect;
- Mechanical removal or cutting: for species of the Asteraceae, pulling should be carried out after maximum elongation of the flowering stem but before seed dispersal. Repeated removal in subsequent years is necessary to reduce the secondary spread of perennial target species and to deplete the seed bank. Mowing can prevent seed production and reduce the vigour of alien species, but it does not kill the plants, which are capable of vigorous regrowth from the base of the stem. Cut biomass contaminated with alien species should be removed from the site.
- Targeted grazing control**;**
- Chemical control**:** although manual methods are generally the preferred option and the use of chemical substances is usually not permitted, selective herbicide treatment (spot application or weed-wiping) may be an acceptable practice on conservation sites, especially when follow-up grazing or mowing is necessary to meet conservation objectives.
- Control of invasive species occurrence sites (road verges, shelterbelts): overseeding with grasses and legumes to fill vacant niches that are otherwise colonised by alien species. Legumes, due to their rapid growth and broad leaf area, quickly cover bare ground, thereby preventing the establishment of invasive species and increasing competition for light. Overseeding along road verges should be carried out immediately after mechanical site preparation in early spring. It may also be applied directly to natural steppe areas. In addition, this method is effective in controlling soil erosion and helps prevent re-colonisation. It is important to note that, in certain situations, some species may also have positive roles from a conservation perspective. Alien species can contribute to maintaining diverse invertebrate fauna and to the formation of suitable habitat structures for fauna, for example for breeding birds, or serve as a food source, such as seeds for passerine birds[17]. Control programmes should therefore be carefully planned, taking into account the possibility of not completely eradicating weed species: in some cases, their complete removal, even if feasible, may be detrimental to wildlife[21].

8.2.5. CONTROLLED BURNING

Controlled burning is an established management practice for grassland ecosystems in many countries in Europe and worldwide. Its purpose is to ensure that burning is carried out in appropriate locations, does not harm sensitive habitats and species, and does not lead to uncontrolled fires. Its application is aimed at maintaining open habitats and reducing the accumulation of dry biomass where other management methods (grazing, mowing, shrub removal) are insufficient or not feasible.

In EU countries, controlled burning is typically carried out on the basis of a plan that includes:

- objectives of the burn;
- selection of the burn site;
- timing of the burn;
- choice of safe burning methods;
- a list of conditions under which burning is prohibited (e.g. strong winds, drought, presence of Red List species in vulnerable phases, etc.);
- measures to reduce risks to people, fauna, sensitive habitats, and infrastructure;
- requirements for staff qualifications and necessary equipment;
- a system for recording and monitoring the implemented activities.

In Ukraine, according to Part 3 of Article 27 of the Law of Ukraine "On the Plant World," the burning of dry vegetation or its residues is carried out in accordance with the procedure established by the central executive authority responsible for shaping state policy in the field of environmental protection.
By Order No. 541 of the Ministry of Environmental Protection and Natural Resources dated August 12, 2021, the Procedure for burning dry vegetation or its residues was approved. This procedure stipulates that burning of dry vegetation is permitted exclusively in cases of fire suppression in ecosystems by fire-rescue units (sections) defined by Articles 60-63 of the Civil Protection Code of Ukraine, based on the decision of the fire suppression commander in accordance with the Charter of actions of the management bodies and units of the Operational Rescue Service of Civil Protection during fire suppression, approved by the Order of the Ministry of Internal Affairs of Ukraine dated April 26, 2018, No. 340, registered with the Ministry of Justice of Ukraine on July 10, 2018, under No. 802/32254.

According to this Procedure, the burning of dry vegetation residues is permitted in the following cases:

- for cooking (in ovens, barbecues, or using other equipment) and heating homes (firewood, brushwood, briquettes);
- for traditional and cultural purposes (bonfires during the Ivan Kupala festival, etc.). Such burning is carried out with prior agreement on the location and timing with local self-government authorities.

Taking the above into account, due to existing legislative restrictions, Ukraine currently lacks legal mechanisms for the application of controlled burning for conservation purposes, which makes it impossible to use this tool even in cases where its application is scientifically justified.

To enable the planning and implementation of controlled burning for the conservation and restoration of steppe habitats, amendments should be made to the Order of the Ministry of

Environmental Protection and Natural Resources dated August 12, 2021, No. 541, "On Approval of the Procedure for Burning Dry Vegetation or Its Residues".

In particular, it should provide for:

- the possibility of applying controlled burning strictly as a conservation measure in clearly defined cases;
- the development of a detailed burning plan;
- the requirement to coordinate such a plan with emergency services authorities and environmental institutions;
- a prohibition on the use of burning in breeding or wintering sites of rare animal species, in locations of plant species with high sensitivity to fire, and in areas with a high risk of fire spreading uncontrollably;
- mandatory post-burn monitoring.

All the above-described measures aim to ensure the removal of excess biomass in a way that promotes the long-term persistence of steppe habitats. The choice of a particular management method depends on the specific conditions of each individual site. As a result, it is advisable to plan such measures within protected areas as part of the preparation of spatial organization projects or management plans, involving relevant stakeholders as an integral component of an overall action plan or strategy, in accordance with international recommendations.
In this document, we have only briefly outlined the main approaches to organizing various management activities for steppe ecosystems within protected areas. However, this topic requires more thorough elaboration and the development of practical guidelines on the organization of grazing, mowing, shrub removal, and invasive species control, which should be included as a key element in the implementation of this Action Plan.

8.3. INCLUSION OF MANAGEMENT MEASURES FOR BIOTOPE (HABITAT TYPE) E1.2 PERENNIAL CALCAREOUS GRASSLANDS AND BASIC STEPPES WITHIN TERRITORY ORGANISATION PROJECTS AND CONSERVATION OF NATURAL COMPLEXES OF PROTECTED AREAS AND NATURA 2000 SITES

In order for the above-described measures to be effective and systematic, they should be integrated into Management Plans (Territory Organization Projects) of Protected Areas, Forest Management Plans, Community Development Plans, and other strategic documents.

For determining management actions for natural steppes, we recommend using the Open Standards for the Practice of Conservation[20].

If steppe ecosystems have been identified as priority conservation values during the management planning process, the next step should be to assess their current condition, formulate the human well-being values produced by these ecosystems, and identify the ecosystem services they provide. Then, direct threats affecting these ecosystems at each specific site are identified, along with the severity of these threats, as well as indirect threats and the root causes behind them. In this way, a situation model is developed for each specific area, opportunities and points of intervention are identified, which then form the basis of the theory of change. The assessment of the condition of priority conservation values serves as the foundation for formulating long-term strategic objectives for steppe ecosystems. These objectives should meet SMART criteria – being Specific**,** Measurable**,** Achievable**,** Relevant**,** and Time-bound. Based on these objectives, strategic tasks are determined and grouped into programs. For steppe ecosystems, such a program may be formulated as "Improvement of steppe ecosystem management." Following the choice of strategy, results chains are built to help achieve both intermediate and long-term conservation and human well-being goals. This is the so-called theory of change, which can be presented in textual, graphical, or other forms. A results chain is a graphical tool that depicts the theory of change as a cause-effect ("if-then") sequence of expected short-term and long-term intermediate outcomes leading to long-term conservation results. Due to the cause-effect nature of the results chain, this tool can also illustrate the temporal aspect of the expected outcomes. The situation model developed in the earlier stages can be used as a foundation for constructing the results chain. This allows for a clear depiction of how the proposed strategy can affect the current situation (as shown in the situation model) and help reach the desired state illustrated in the results chain. These results chains (theories of change) include the key actions necessary for the successful implementation of the strategy. It is also important to establish clear criteria for assessing the effectiveness of the measures implemented to achieve these outcomes, to conduct continuous monitoring of their effectiveness, and, where necessary, to make adjustments to the proposed plan.

This approach to management planning makes it possible to properly set priorities in conservation activities and to allocate available resources effectively. When constructing a results chain within the theory of change for improving the management of steppe ecosystems, it is important to focus on existing threats and their root causes, and to identify among them the "points of intervention" that will allow the situation to be changed and the set objectives to be achieved.

8.4. ORGANIZATION OF THE RESTORATION OF STEPPE AREAS OF BIOTOPE (HABITAT TYPE) E1.2 PERENNIAL CALCAREOUS GRASSLANDS AND BASIC STEPPES, INCLUDING THOSE DAMAGED BY UNSUSTAINABLE LAND USE AND MILITARY ACTIONS

Given that over 90% of steppe areas have been ploughed and converted into arable land, the steppe biome in Ukraine has been almost entirely destroyed. Only small patches of upland steppes have been preserved within protected natural areas. These areas are scattered among vast agricultural fields and are typically isolated from one another, leading to a loss of ecological connectivity and disruption of natural processes within them. A significant number of these patches have been, and continue to be, affected by active military operations and associated impacts such as frequent fires, destruction of turf due to explosions, construction of fortifications, and the

movement of heavy military equipment. The isolation of steppe patches from one another and their small size hinder the spontaneous recovery of steppe vegetation even when these areas are taken out of agricultural use, primarily due to the lack of a sufficient number of steppe plant diaspores. Such areas require active restoration and rehabilitation efforts aimed at reducing fragmentation.

Given that active restoration and rehabilitation of steppe ecosystems require substantial resource inputs and time – and that the success of such efforts is not always predictable – these activities must be based on scientific justification and careful planning.

The method of restoring steppe vegetation depends on the type of site (e.g. arable land, pasture) and its condition (such as the degree of soil degradation, state of the vegetation, and the presence of other types of contamination, e.g. resulting from warfare). The first step is to assess the structure of the surrounding land to determine whether the restoration of the steppe ecosystem will be sustainable over time. It is best to select those sites where restoration can contribute to improving the connectivity of natural ecosystems (for example, those located near protected areas, semi-natural grasslands, or other areas of natural vegetation). Next, the site should be prepared for seeding (e.g. by neutralising the effects of previous agricultural sowing). Restoration can be carried out by sowing a grass seed mixture (preferably using se Restoration can be carried out through sowing a grass seed mixture (preferably using seeds or hay from natural steppe sites within the same region, in order to avoid genetic contamination of the local gene pool) or by transferring soil from nearby natural steppe areas.

ed or hay collected from a natural steppe site in the same region) or by transferring soil from nearby natural steppe plots. The following stage is continuous monitoring, as there is a risk of the native grasses being suppressed by alien species. Once steppe vegetation has been established, the site should be maintained through periodic mowing or low-intensity rotational grazing (ideally by horses, though cattle grazing is also possible)[33].

In Ukraine, at the moment there are still only a few projects aimed at restoring the steppes. One example is the initiative of ecologist Oleksii Burkovskyi to restore a steppe ecosystem, which was halted due to the full-scale invasion of Ukraine by the russian federation but may serve as a basis for developing methodological recommendations for such activities[34,35]. Another valuable example is the experience of the NGO “Rewilding Ukraine” in restoring the unique Tarutynskyi steppe in Odesa region, which was ploughed up in 2016[36].

To carry out active restoration of lost steppe ecosystems, the following legal mechanisms need to be applied:

To simplify land conservation, including through grassland restoration, the following measures should be taken:

[33] https://nbs.wwf.ua/methodology/vidnovlennia-stepiv/
[34] https://www.pravda.com.ua/articles/2021/11/19/7312075/
[35] https://www.pravda.com.ua/podcasts/6452744ecd398/2023/07/25/7412869/
[36] https://hmarochos.kiev.ua/2024/01/02/yak-vidnovlyuyut-zapovidni-stepy-pivdnya-ukrayiny/

a) Allow land conservation at the initiative of the landowner regardless of soil quality indicators that justify the need for conservation. In other words, grant the right to conserve land of any quality, even fertile land (Article 51 of the Law of Ukraine "On Land Protection"), since such a step aligns with the objectives of Ukraine's environmental and EU integration policies;

b) Introduce mandatory conservation upon order of the relevant authority if soil quality indicators necessitate it. In such cases, all costs should be covered by the state, and the landowner should receive payments for ecosystem services to compensate for losses resulting from the cessation of active land use;

c) Abolish the requirement for detailed land management projects for land conservation (Article 54 of the Law of Ukraine "On Land Management") and replace them with either a landowner's application or a government decision in cases of voluntary conservation, or with an official order if conservation is mandated due to soil quality indicators.

Prohibit ploughing and any other types of soil cultivation on slopes with a gradient of more than three degrees (Article 47 of the Law of Ukraine "On Land Protection").

Develop and approve methodologies for the restoration of steppe vegetation on ploughed areas.

8.5. ORGANIZATION OF MONITORING SYSTEM FOR THE CONSERVATION STATUS OF BIOTOPE (HABITAT TYPE) E1.2 PERENNIAL CALCAREOUS GRASSLANDS AND BASIC STEPPES IN UKRAINE AS PART OF BIODIVERSITY MONITORING

Monitoring of habitat conservation status is regulated by Articles 11 and 17 of the Habitat Directive. Article 11 establishes the obligation to undertake surveillance of the conservation status of natural habitats, with special attention to priority habitat types.

According to Article 17, Member States are required

to report every six years on the implementation of measures taken under the Directive. Based on the submitted national reports, a consolidated EU-level report is prepared, which should include an assessment of the progress achieved and, in particular, the contribution of the Natura 2000 network to the objectives of the Directive. Some Member States have developed and are already implementing dedicated, standardized monitoring programs. Others rely on data from existing monitoring initiatives, while many are still in the process of developing, implementing, or revising their monitoring schemes. Analysis has revealed considerable variation in the quality and quantity of survey data used to assess the conservation status of habitat types. Most Member States apply sample-based monitoring approaches, including field surveys; however, data collection methods, sample sizes, and levels of statistical reliability vary significantly[37].

[37] European Commission. 2021. EU Habitat Action Plan to maintain and restore to favourable conservation status the habitat type 4030 European dry heaths. Brussels: European Commission. 58 p.

The analysis[38] has identified several best practices that can serve as recommendations for sample-based monitoring of habitats under the parameter "Structure and functions":

- A sufficiently large sample size to allow reliable assessment of changes in the condition of the habitat type;
- Stratification of the sample in proportion to the area covered by habitat types and whether they are located inside or outside protected areas;
- Surveys of habitat types conducted on permanent sample plots;
- Monitoring of each sample plot at least once during each reporting period, with multiple surveys in the case of anthropozoogenic habitat types that respond quickly to changes in land use or pressure;
- Recording of typical plant species, at least through approximate quantitative lists or vegetation surveys;
- Recording of typical animal species from known taxonomic groups that serve as indicators for habitat assessment.

To assess the validity and effectiveness of management measures, it is necessary to carry out thorough, scientifically based habitat monitoring using standard scientific protocols. Habitat condition monitoring should provide clear indicators of management outcomes (effectiveness, ineffectiveness, damage).

Some possible indicators for assessing the effectiveness of management measures:

- Area of the habitat with favourable conservation status;
- Change in the total area of the habitat and in specific locations;
- Increase in the area under management, improvement or maintenance of its favourable status, improvement in the status of typical species, regression of undesirable species (woody species, nitrophilous species, etc.);
- Habitat diversity – presence of typical, declining or rare species, presence of problematic species;
- Floristic composition: species diversity (presence and status of typical plant and invertebrate species), vegetation structure, indicator species (both positive and negative, from various organism groups, including soil biota);
- Key parameters of successional processes (cover and height of shrubs and trees);
- Area under appropriate management;
- Cost of measures and available funding.

In Ukraine, monitoring of biological and landscape diversity must be conducted in accordance with the Procedure for Monitoring Biological and Landscape Diversity, approved by the Resolution of the Cabinet of Ministers of Ukraine dated January 17, 2025, No. 45[39]. The Procedure stipulates that the biodiversity monitoring system will be implemented based on the national level Biological and Landscape Diversity Monitoring Program, which the Ministry of Environmental Protection and

[38] Ellwanger, G., Runge, S., Wagner, M., Ackermann, W., Neukirchen, M., Frederking, W., Müller, C., Ssymank, A. & Sukopp, U. 2018. Current status of habitat monitoring in the European Union according to Article 17 of the Habitats Directive, with an emphasis on habitat structure and functions and on Germany. - Nature Conservation 29: 57-78. (https://doi.org/10.3897/natureconservation.29.27273).

[39] https://www.kmu.gov.ua/storage/app/uploads/public/678/a91/f18/678a91f1826c3578339888.pdf

Natural Resources (hereinafter – the Ministry of Environment) is required to develop within one year from the date of entry into force of Resolution No. 45.

When developing a monitoring system for Ukraine's steppe ecosystems, it is advisable to apply the best international practices[40], which are defined by the following criteria/indicators:

(1) Monitoring objectives;
(2) Targeted selection of monitoring objects;
(3) Systematic and continuous implementation with mandatory reporting;
(4) Structure and implementing authority(ies);
(5) Methods (data collection and analysis);
(6) Data management system and data policy;
(7) Funding;
(8) Human resources;
(9) Infrastructure;
(10) Partners and stakeholder engagement.

8.6. IMPLEMENTATION OF ECO-EDUCATIONAL ACTIVITIES TO RAISE AWARENESS AMONG VARIOUS STAKEHOLDER GROUPS AND THE GENERAL PUBLIC ABOUT THE IMPORTANCE OF BIOTOPE (HABITAT TYPE) E1.2 PERENNIAL CALCAREOUS GRASSLANDS AND BASIC STEPPES

The conservation of steppe ecosystems is significantly hindered by the fact that, in public perception, the steppe does not hold the same conservation value as, for example, forests. Grassland habitats are often perceived as marginal or unproductive land that needs to be "improved" for use, for instance by ploughing or afforestation.

This perception explains the ongoing destruction of the last remnants of steppes, which has not ceased even in recent decades, despite the overall rise in environmental awareness among the population and European integration processes. Therefore, when planning conservation actions for steppe ecosystems, priority should be given to organizing and conducting eco-educational activities for all segments of society – from schoolchildren and students to high-level decision-makers.

[40] Varukha, A., Vasyliuk, O., Spinova, Y., Kuzemko, A., Drapaliuk, A., Marushchak, O., Kovbasniuk, A., Kolomytsev, H., & Drebet, M. (2025). On the development of criteria for assessing the biodiversity monitoring system in Ukraine. In I. Dmytrash-Vatseba, T. Mykytyn, N. Kapets, & A. Kravets (Eds.), Dnister Readings: Proceedings of the II International Conference of the Dniester Regional Landscape Park (3 October 2025, Tlumach, Ivano-Frankivsk Oblast, Ukraine) (pp. 53–58). Dniester Regional Landscape Park named after Serhii Didych. Odesa: Oldi+.

At the local level, the leading role in implementing eco-educational activities should belong to protected areas, which can conduct thematic lessons and conservation campaigns with school youth, as well as training sessions with stakeholders – representatives of local authorities, private entrepreneurs, farmers, teachers, and community members. Similar activities can also be carried out at the regional level.

At the national level, it is advisable to organize a strong information campaign to promote the protection of the steppes, featuring presentations by scientists and conservationists in the mass media, publications on social networks and online platforms, and the organization of thematic art and photography exhibitions.

Currently there is a significant need to create high-quality informational content dedicated to the steppes, including documentary films, thematic TV and radio programs, podcasts, YouTube channels, and more. There is also a need for high-quality popular science literature that presents the richness of Ukraine's steppes in a form accessible to a wide audience, as well as for its promotion in the domestic market.

To popularize the steppes, it is worth more widely applying citizen science tools, for example, by organizing thematic contests and bioblitz events on the iNaturalist platform.

Each year on 30 May, Ukraine marks Steppe Day, which was established in 2017. Although this is currently an unofficial observance, its status should be elevated, and this occasion should be used to organise larger-scale initiatives dedicated to the protection and promotion of steppe ecosystems.

8.7. COOPERATION AND COORDINATION OF NATURE CONSERVATION MEASURES

Currently, Ukraine lacks a specialized institution dedicated to the study and conservation of steppe ecosystems. Scientific research on steppes is carried out by various scientific and educational institutions, including the M.G. Kholodny Institute of Botany of the NAS of Ukraine, the I.I. Schmalhausen Institute of Zoology of the NAS of Ukraine, Kherson State University, Yuriy Fedkovych Chernivtsi National University, the Askania Nova Biosphere Reserve named after F.E. Falz-Fein of the NAAS of Ukraine, the Black Sea Biosphere Reserve, Yelanetsky Steppe Nature Reserve, Luhansk and Ukrainian Steppe Nature Reserves, Podilski Tovtry, Buzkyi Gard, Kamianska Sich, Meotyda National Nature Parks and other protected areas, as well as public organizations such as the Ukrainian Nature Conservation Group, Rewilding Ukraine, among others. However, it should be noted that such studies are conducted within the framework of each institution's research agenda and are not well coordinated.

The central executive authority in the field of environmental protection and natural resources somewhat coordinates such research, but currently lacks sufficient staffing capacity to do so.

Therefore, there is an urgent need to establish a specialized institution dedicated specifically to the study of steppe ecosystems. Such an institution could be established as a Steppe Institute, with its human resource capacity formed by researchers from protected areas within the steppe zone, including those that were located in temporarily occupied territories and have been relocated to areas under the control of Ukraine.

Practical examples

This section presents examples of steppe ecosystem management in three national nature parks of Ukraine. The factual basis for these examples is provided by situational models and theories of change developed jointly with park administrations during a workshop of experts and stakeholders on the restoration and maintenance of habitat type E1.2 through controlled grazing in target national parks, as well as on the strategic planning of E1.2 habitat management in Ukraine in accordance with the requirements of the Habitats Directive (Ecological Research Station “Hlyboki Balyky”, Balyko-Shchuchynka village, Kyiv Region, 26–28 February 2025), and during the strategic session “Management of steppe habitats: modern approaches to conservation and restoration” (Buzkyi Gard National Nature Park, 18–19 November 2025).

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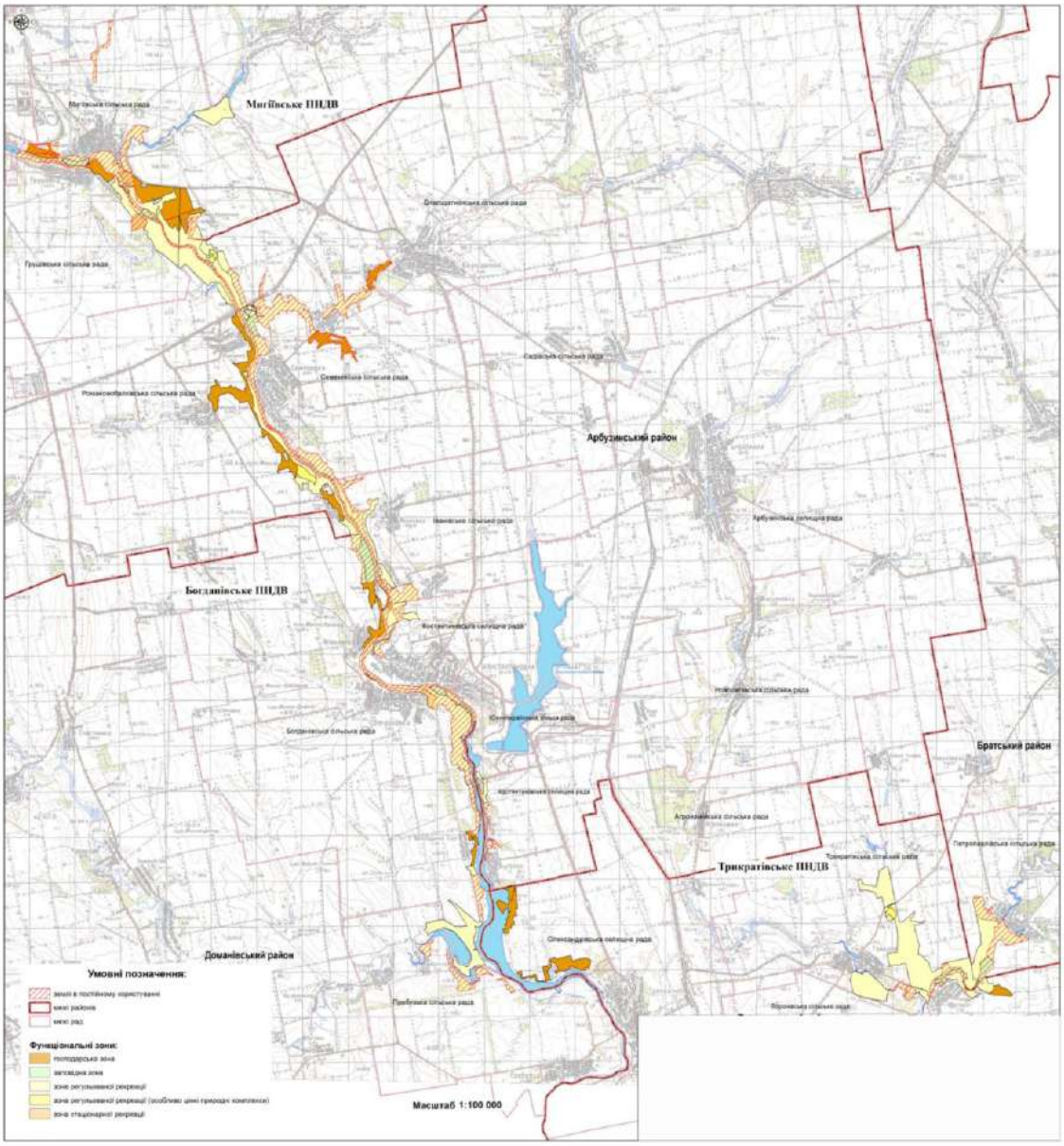
Buzkyi Gard National Nature Park



Buzkyi Gard National Nature Park was established by the Decree of the President of Ukraine of 30 April 2009 No. 279/2009.

The total area of the park is 6,138.13 ha.

The park is located in Pervomaiskyi and Voznesenskyi districts in the north of Mykolaiv Oblast, within the valleys of the Southern Bug, Mertvovod, Korabelna, and Arbuzynka rivers.

Almost the entire territory of Buzkyi Gard National Nature Park is included in the Emerald Network site “Buzkyi Gard National Nature Park” (SiteCode: UA0000040), with an area of 6,148.00 ha.

Steppe ecosystems within the Park cover 2,777 ha.

True steppe ecosystems within the Park

Petrophytic steppes

Meadow steppes

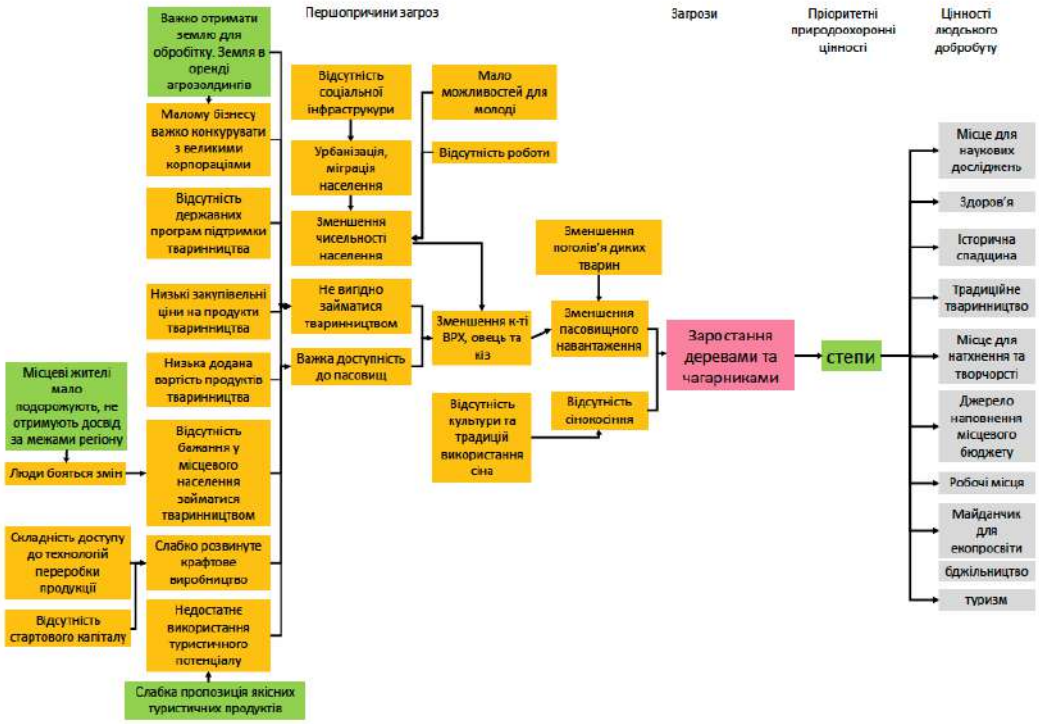
Of the 34 species of vascular plants listed in the Red Book and recorded within the Park as of the end of 2025, at least 27 species are associated with steppe habitats.

	
Spring pheasant's-eye	Meadow pasqueflower

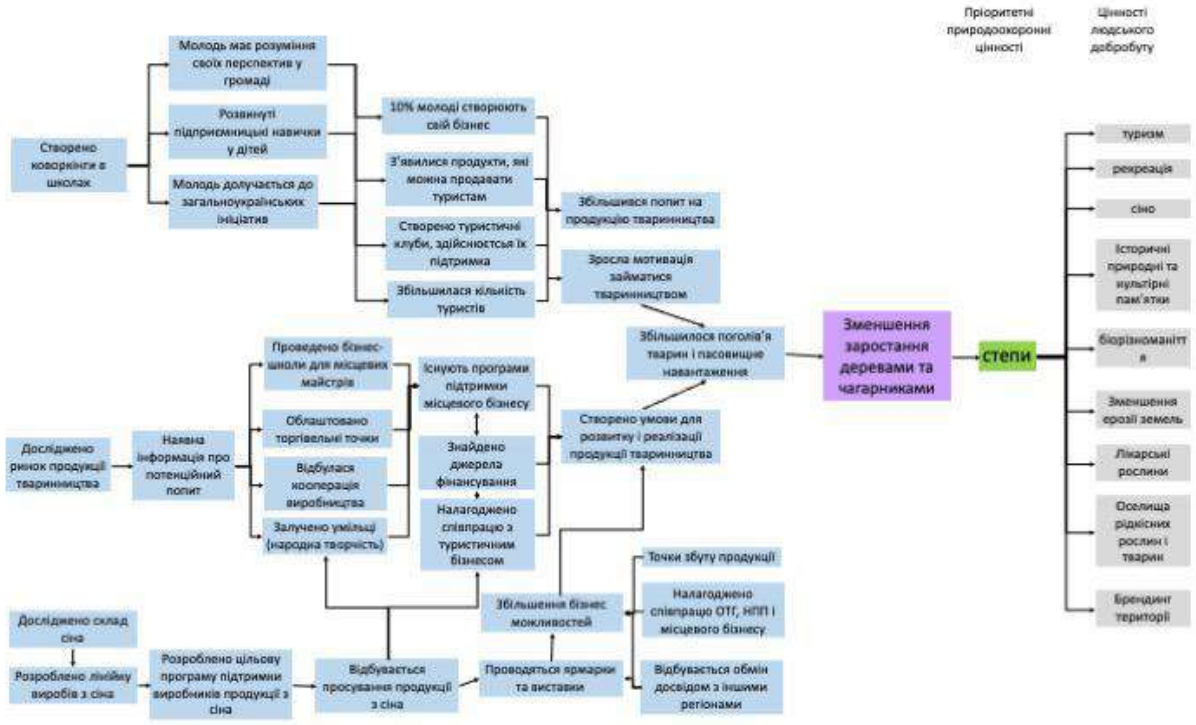
	
Buzka catchfly	Buzkyi tulip
	
Scarce swallowtail	Female stag beetle
	
Green lizard	Common wheatear

Main threats to steppe habitats: absence of livestock grazing, overgrowth of shrubs, afforestation (scientifically unjustified), fires, collection/destruction of plants, flooding of areas – Tashlyk Pumped Storage Power Plant impact zone.

Situational model:



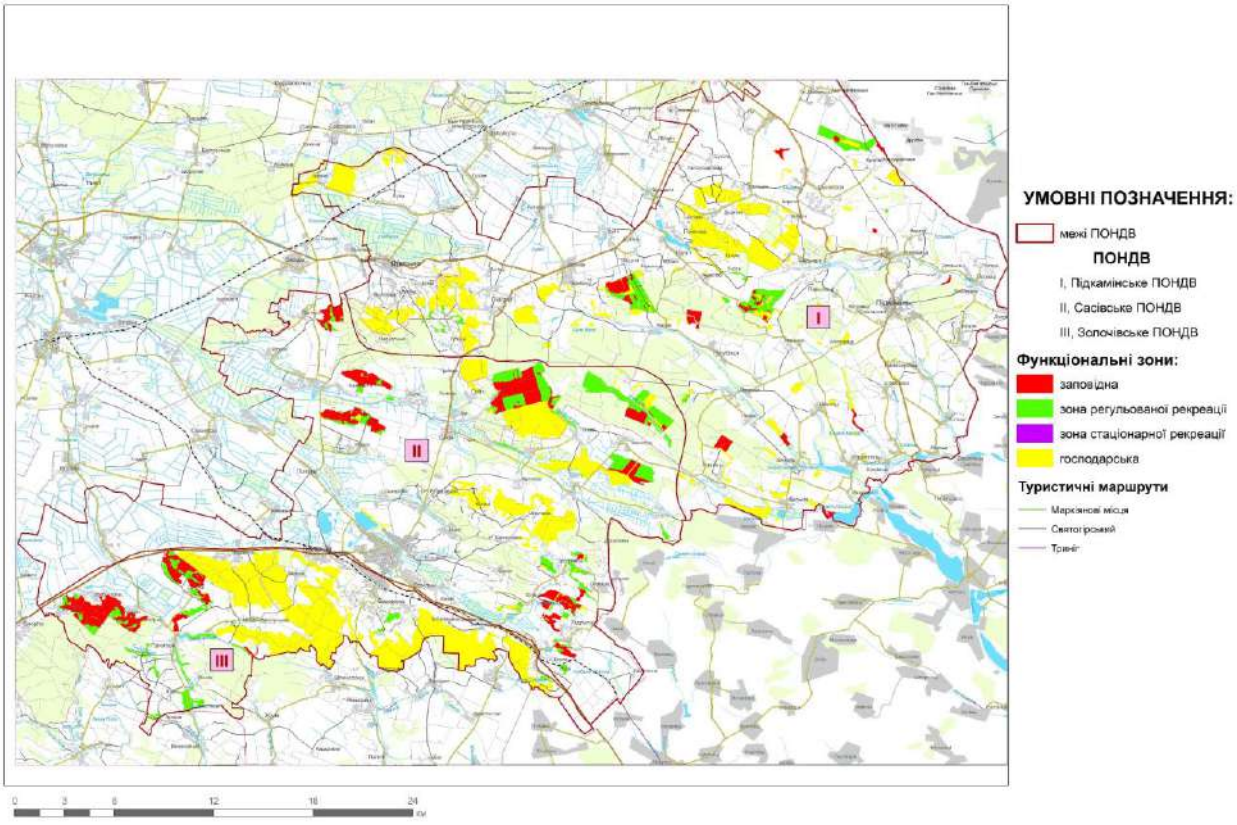
Theory of change



Pivnichne Podillia National Nature Park

Pivnichne Podillia National Nature Park was established in accordance with the Decree of the President of Ukraine of 10 February 2010 No. 156/2010 “On the establishment of the Pivnichne Podillia National Nature Park.”

The total area of the Park is 15,587.92 ha, including 5,434.4 ha of land granted for permanent use and 10,153.52 ha of land included within its territory without withdrawal from land users.



Map scheme of the Pivnichne Podillia National Nature Park.

The Pivnichne Podillia National Nature Park is located in Lviv Oblast, Zolochiv District (Zolochiv City Council, Pidkamin Settlement Council, Zabolottsi Rural Council).

The territory of the Park is included in the Emerald Network site “UA0000120 Pivnichne Podillia”.

In total, 554 ha within the Park are occupied by meadow-steppe vegetation.

Meadow steppes within the Pivnichne Podillia National Nature Park, Lysa Hora tract and Sypukha Hill. © P. Hryniuk

Localities of at least 15 plant species listed in the Red Book of Ukraine (2021) and 6 plant species included in the appendices of the Bern Convention are associated with steppe habitats. The speckled ground squirrel is under threat of extinction and is listed in both the Bern Convention and the Red Book of Ukraine.

	
Narcissus-flowered anemone © Volodymyr Batochenko	Lady's slipper orchid © H. Pankovska
	
Daphne mezereum © M. Shyshka	Tatarian sow-thistle © P. Hryniuk

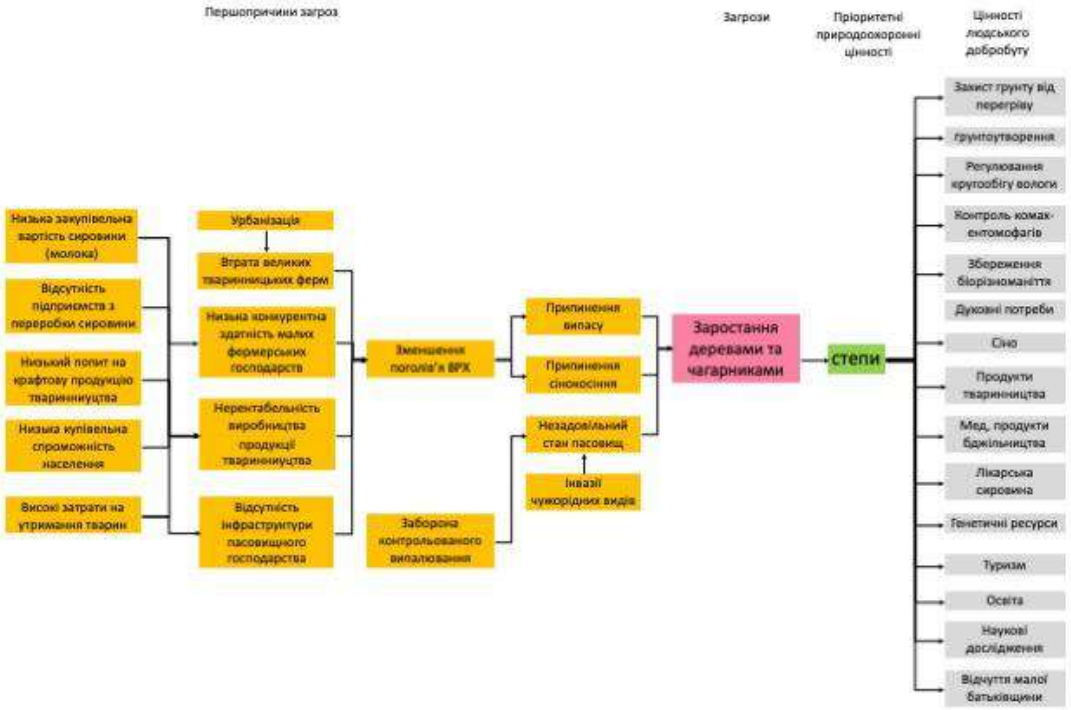
	
Spotted viper’s bugloss © M. Shyshka	Military orchid © M. Shyshka
	
Clouded Apollo © P. Hryniuk	Icarus blue © P. Hryniuk

	
Juvenile common buzzard © M. Shyshka	Speckled ground squirrel © M. Rusin

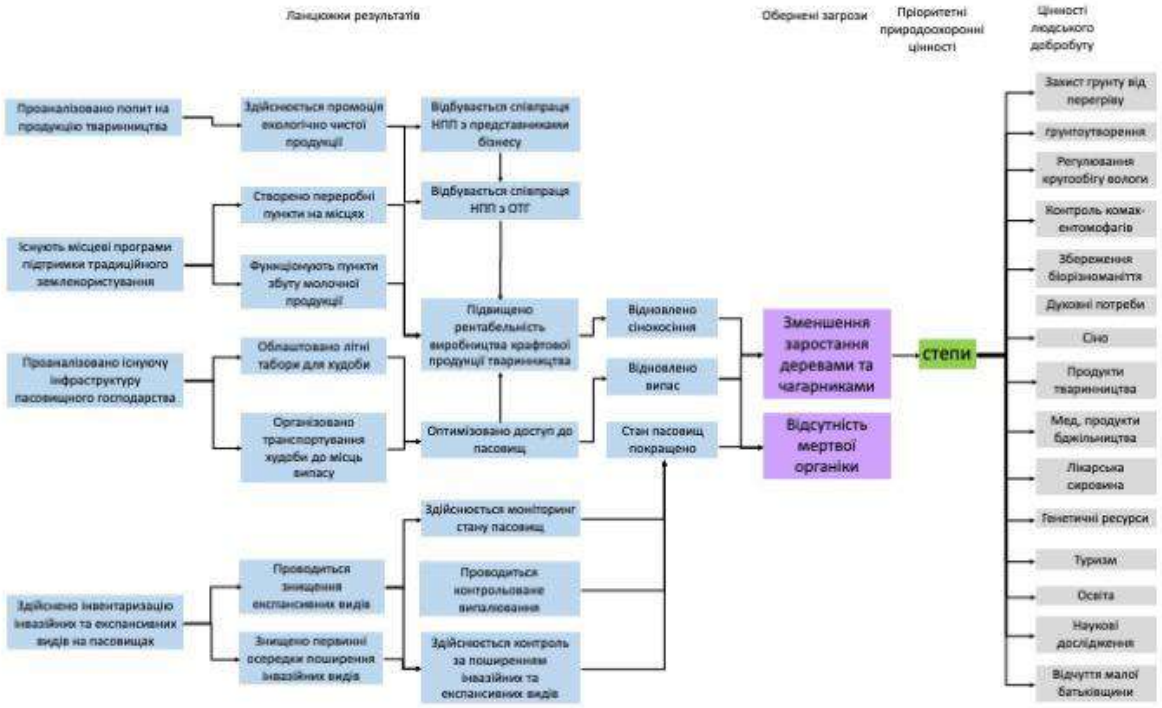
The main threat to steppe habitats is the rapid overgrowth of steppe areas by trees and shrubs, caused by the introduction of a strict protection regime (cessation of grazing and periodic burning). A particular threat is also posed by the rapid expansion of *Pinus nigra* and *P. sylvestris*, *Crataegus curvisepala* and *Swida sanguinea* (L.) Fourr.

Overgrowth of meadow-steppe areas by woody and shrub vegetation within the Pivnichne Podillia National Nature Park, Stinka tract © P. Hryniuk

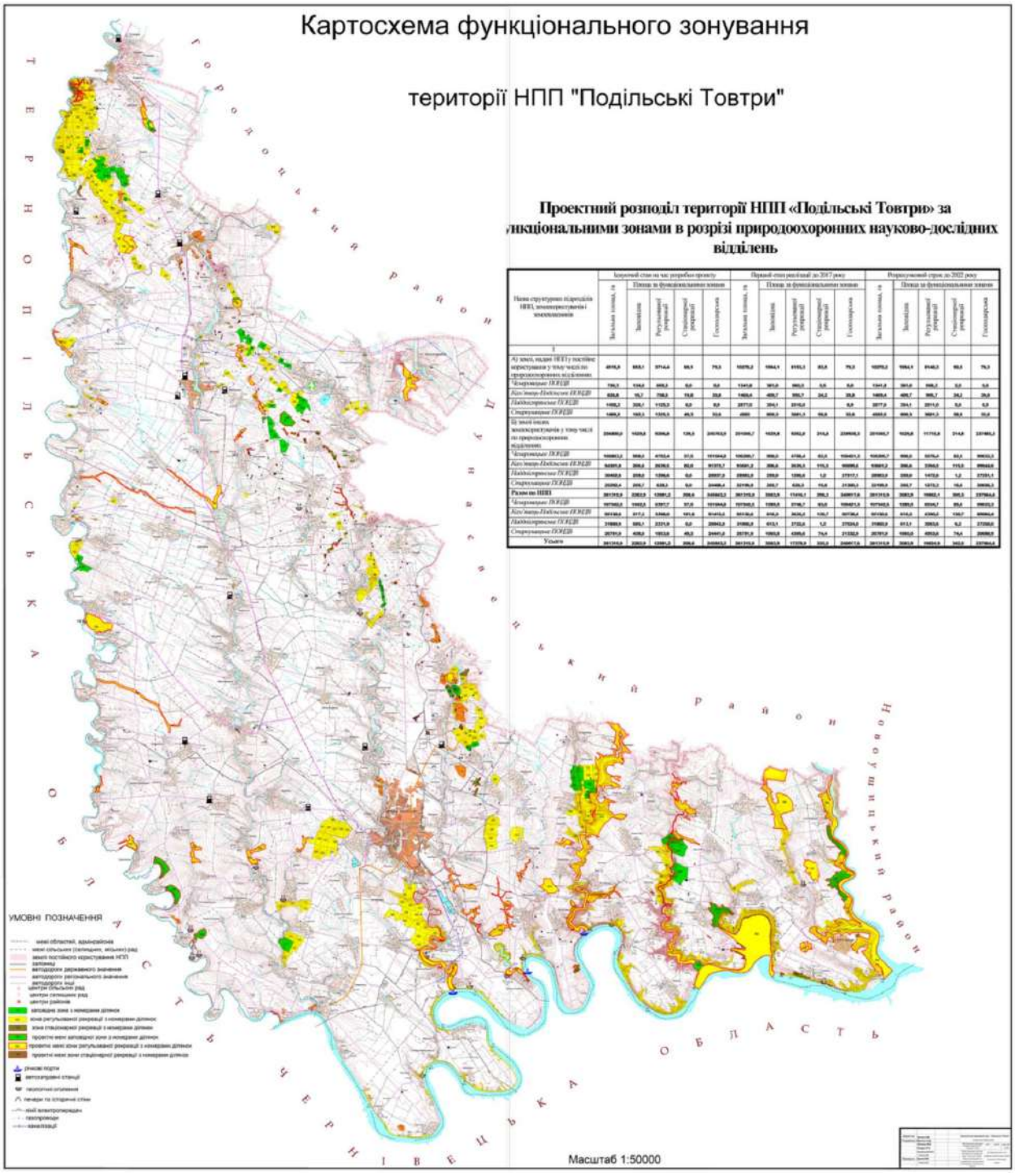
Situational model



Theory of change



Podilski Tovtry National Nature Park



Map scheme of the Podilski Tovtry National Nature Park with functional zoning.

The Podilski Tovtry National Nature Park was established in accordance with the Decree of the President of Ukraine of 27 June 1996 No. 474/96.

The Park is located in Kamianets-Podilskyi and Khmelnytskyi administrative districts of Khmelnytskyi Oblast. The territory of the Park overlaps with the Emerald Network site “UA0000011 Podilski Tovtry National Nature Park.”

The total area of the Park is 261,316 ha, including approximately 24,000 ha occupied by steppe habitats.

Steppe habitats of the Park, Zbruch River valley © M. Drebet

Petrophytic steppes © M. Drebet

	
Montpellier milkvetch © M. Drebet	Wood anemone © M. Drebet

	
Pale grape hyacinth © M. Drebet	Greater pasqueflower © M. Drebet
	
Common kestrel © M. Drebet	Red-backed shrike © M. Drebet

At least 27 species of plants and animals associated with steppe habitats are included in the Red Book of Ukraine, and 5 species are protected under Resolution 6 of the Bern Convention.

Main threats to steppe habitats: invasions involving alien species, terracing of slopes, artificial afforestation of steppe areas, replacement of meadow-steppe communities by xerothermic fringe vegetation, overgrowth by trees and shrubs, shading of rocks, invasions of non-native plant species, extractive activities, uncontrolled tourist pressure, overgrazing/absence of grazing, illegal dumping, uncontrolled grass burning, ploughing, ruderalisation, construction.