

VULNERABILITY OF HABITATS OF THE EMERALD NETWORK TO INVASIONS OF ALIEN PLANTS IN PRIDNEPROVSK LEFT-BANK FOREST-STEPPE (UKRAINE)

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ABSTRACT

The paper presents the results of research on the populations of alien plant species of the Pridneprovsk Left-Bank Forest-Steppe, which are able of being invasive in the habitats of the Emerald Network. The received data are the result of many years of research carried out during period 2000-2018. In the investigated territory, we identified 277 alien plant species. Most are kenophytes, epecophytes,

ephemerophytes, and colonophytes. They are distributed mainly in natural and semi-natural phytocoenoses. Most species are dominant and produce an influence on the structure of habitats and biotopes. Populations of alien plant species were identified in 33 types of habitats of the Emerald Network of the Pridneprovsk Left-Bank Forest-Steppe and have different hierarchical levels.

REZUMAT: Vulnerabilitatea habitatelor Rețelei Emerald la invaziile plantelor străine în silvostepa situată pe malul stâng al Niprului (Ucraina).

Lucrarea prezintă rezultatele unor cercetări referitoare la populațiile de specii străine invazive de plante în habitate ale Rețelei Emerald, situate în silvostepa de pe malul stâng al râului Nipru. Datele obținute sunt rezultatul a mulți ani de cercetare între 2000-2018. În teritoriul investigat au fost identificate 277 de specii de plante străine invazive. Cele mai multe sunt kenofite, epecopfite,

ephemerofite și colonofite. Acestea au o distribuție preponderent în fitocenoze naturale și seminaturale. Cele mai multe specii sunt dominante și au o influență edificatoare asupra habitatelor și a cenozelor. Populațiile speciilor străine au fost identificate în 33 de tipuri de habitate ale Rețelei Emerald prezente în silvostepa de pe malul stâng al Niprului, având diferite nivele ierarhice.

ZUSAMMENFASSUNG: Die Empfindlichkeit der im Emerald Netzwerk erfassten Habitate auf die Invasion fremdländischer Pflanzenarten derim linksseitigen Vorland des Dnjepr/Flusses gelegenen Waldsteppe (Ukraine).

In diesem Beitrag werden die Ergebnisse der Untersuchung über die Population der zur Invasion in den Lebensräumen des Emerald-Netzwerkes fähigen Adventivpflanzen in der im Dnjepr Vorland liegenden Waldsteppe (Prydniprowsky) (Ukraine) vorgestellt. Alle Angaben beruhen auf langjährigen, von 2000 bis 2018 durchgeführten Untersuchungen. In dem Gebiet wurden 277 Arten von Adventivpflanzen festgestellt. Die meisten davon sind Neophyten,

Epekophyten, Ephemerophyten, Kolonophyten. Sie kommen überwiegend in den natürlichen und naturnahen Pflanzengemeinschaften vor. Die meisten Arten sind dominant und haben einen Einfluss auf die Struktur der Biotope und Lebensräume. Die Populationen der Adventivpflanzen wurden in 33 Typen der geschützten Lebensräume in der Prydniprowsky Waldsteppe festgestellt und haben unterschiedliche hierarchische Ebenen.

INTRODUCTION

Today, the concept of habitat in the biodiversity conservation most fully represents a comprehensive approach to solving the problem. For European countries there has been developed the recommended list of habitats that are endangered and need special protection measures – habitats of the Emerald Network (Resolution no. 4, 1996). Herewith, conservation measures are directed towards the spatially-defined and currently integral ecosystem-organized objects, the functional elements of which are not merely populations of protected species but also a complex of externally operating factors and balanced relationships between populations, facilitating their long-term existence. This is a very important aspect that determines the vulnerability of such

MATERIAL AND METHODS

The object of the study is the populations of alien plants of the Pridniprovsk Left-Bank Forest-Steppe that are able of invasions in habitats which are endangered and need some special protection measures (Resolution no. 4, 1996).

The lists are adapted based on our own data, derived from studies of the region. The habitats list for sampling has been performed on the basis of relevant literature references (Onyshchenko, 2016; Kuzemko et al., 2017) with further adaptation according to the data obtained during the study in the region.

The names of species and their authors were indicated based on Vascular plants of Ukraine. A nomenclature Checklist (Mosyakin and Fedoronchuk, 1999). The groups of alien species were classified by Protopopova (1973, 1991), Kornaś (1968, 1977). Analysis of species by their time of introduction was performed according to the classification of Kornaś (1968, 1977); the degree of naturalization – according to classification scheme of Schroeder (1969), which has been modified by Protopopova and Shevera (2005, 2012).

objects in the moment of the change in their internal structure. One of the mechanisms of their structural changes is the invasions of alien species. In Ukraine, the problem of phytoinvasions is extremely topical and therefore research into these has been intensified (Protopopova et al., 2002, 2009, 2012; Abduloyeva et al., 2009; Burda et al., 2015; Dvirna, 2015). Currently, there does not exist any list of alien species which manifest invasiveness regarding the habitats of the Emerald Network and the status of their populations in these specific habitats. Therefore, the present research aimed at covering these data for Pridniprovsk Left-Bank Forest-Steppe, and initiating this direction of research in the region.

The determination and analysis of invasive plant species is based on the classification proposed by Richardson and Pyšek (Richardson et al., 2000a). Types of plant strategies are presented by Grime (1979).

Data on the distribution of alien plants in appropriate habitats were received during 2000-2018 as a result of field work for floristic-geobotanical research of the region and from the specific literature (Shevchyk et al., 1996; Galchenko, 2006; Dzhuran et al., 2007; Protopopova et al., 2002, 2009, 2012; Zavyalova and Korniyenko, 2014; Vorobyov et al., 2017).

The summary of the database consists in the analysis of 215 full geobotanical descriptions. As part of the research we draw up a table with the data on the participation of individual alien species in plant communities, diagnosing the appropriate types of habitats. The table which was supplemented by data from the register of routine floristic researches and from the above-mentioned references. Due to the heavy volume and the poor structuring of this table the material is presented in the body of the text.

RESULTS AND DISCUSSION

The checklist of alien vascular plants of the Pridneprovsk Left-Bank Forest-Steppe (the Dnipro Valley within the zone of the Forest-Steppe) contains 277 species. Most of the listed species belong to kenophytes; to the groups of ephemerophytes, epecophytes, and colonophytes, of which the existence is primarily determined by the permanent effect of the anthropogenic factor. Plenty of them tend to spread into phytocoenoses of a natural and semi-natural type. Moreover, a great number of these species are dominant and have significant structural impact on habitats, including those protected in Europe (Resolution no. 4, 1996).

In the group of protected habitats of continental surface waters (C) 15 varieties of different hierarchical levels (C1.222, C1.223, C1.224, C1.225, C1.226, C1.25, C1.32, C1.33, C1.3411, C1.3413, C1.67, C2.33, C2.34, C3.4, C3.51) are registered on the territory of the region according to the EUNIS classification (Onyshchenko, 2016a). For C1.22 and C1.32 habitats (free-floating communities of mesotrophic and eutrophic reservoirs) within Kyiv (Svyatoshinsky District) we observed the invasion of the single species *Pistia stratiotes* L. The species is co-dominant in the communities of *Hydrocharis morsus-ranae* L. on the surface of the ponds where collected surface-waste water is dumped which determines an abnormally high temperature regime of reservoirs. Further distribution of this alien species is probable in the similar urban areas with an exaggerated thermal regime.

Two alien species of the genus *Elodea* Michx are widespread in the habitats of C1.33 and C1.34 groups (rooted submerged and floating vegetation of mesotrophic and eutrophic waterbodies) and C2.33 and C2.34 groups (eutrophic and mesotrophic vegetation of slow-flowing rivers). Besides, *Elodea canadensis* Michx has a relatively deep history of resettlement in this territory (the end of the 19th to the beginning of the 20th century) and

widespread (as on the floodplain of the Dnipro (Dnieper, Nistru) and its tributaries, and in reservoirs of the watershed). *Elodea nuttallii* (J. Planch.) St. John has been found in the reservoirs of the Dnipro Cascade relatively recently (Chorna et al., 2006) and for the time being only some separate plots with its distribution have been observed within the water area of the Kaniv and the Kremenchug Reservoirs. Both species of *Elodea* are most often found in communities of alliances Potamogetonion Libbert 1931, Batrachion fluitantis Neuhdusl 1959, Nymphaeion albae Oberd. 1957 (Mucina et al., 2016; Solomakha et al., 2017), where they function as co-dominants and dominants.

In shallow waters and on the bottom of dried-out bays in communities of low-growing amphibious annuals (C3.51), in particular, freshwater low-growth groups with the dominance of *Eleocharis acicularis* (L.) Roem. and Schult. and communities of the Eleocharition soloniensis Philippi 1968 alliance, 14 alien species were found. The populations of the majority of them (*Amorpha fruticosa* L. (in a germinant status), *Eragrostis pilosa* (L.) Beauv., *Eragrostis suavelens* A. Beck. ex Claus., *Eragrostis minor* Host, *Conyza canadensis* (L.) Cronq., *Echinochloa crus-galli* (L.) Beauv., *Anagallis arvensis* L., *Setaria viridis* (L.) Beauv., *Setaria glauca* (L.) Beauv., *Digitaria ischaemum* (Schreb.) Muehl., *Xanthium albinum* (Widd.) H. Scholz) function as ephemerophytes under the conditions of these biotopes.

In other words, their presence here is determined by the possibility of skipping diaspores, but not by the ability to reproduce their populations in situ. One species (*Chenopodium rubrum* L.) due to the short period of vegetation and the ability to form a seed bank capable of associativity within these communities and function as an assectator or a co-dominant. The populations of three invasive species (*Acorus calamus* L., *Typha laxmannii* Lepech. and *Zizania latifolia* (Griseb.) Stapf within these biotopes lead to their gradual

transformation. Most often, new invasions of these three species take place by skidding flowing water of plant rhizomes and their gradual overgrowth. For *Zizania latifolia* we have noted examples of seed restoration.

In communities of swamps with the domination of tall-growth sedges (D5.2) nine invasive species were registered. In most cases, their growth (*Acorus calamus*, *Althaea officinalis* L., *Bidens frondosa* L.) is observed in the boundary zones of the contact of communities of the Magnocaricion elatae Koch 1926 union with neighboring communities which collectively form the contour of the specified habitat. Invasions of such species as *Amorpha fruticosa*, *Echinocystis lobata* (Michx) Torr. and Gray, *Epilobium adenocaulon* Hausskn., *Acer negundo* L., *Petasites hybridus* (L.) Gaertn, and *Petasites spurius* (Retz.) Reichenb. lead to the gradual transformation of autochthonous plant communities and significant changes in their structure and properties of the biotope. Usually, the entry and initial stages of the formation of their populations occur on small plots that appear as the transformed fragments of these biotopes as a result of zoogenous, pyrogenic, and grazing influences.

In steppic and perennial calcicolous communities of Festucetalia valesiaca Soy 1947 order (E1.2) 55 invasives have been noted. The population of most of the r-strategy species (*Camphorosma annua* Pall., *Lactuca serriola* L., *Lappula squarrosa* (Retz.) Dumort., *Atriplex tatarica* L., *Setaria viridis*, *Setaria verticillata* (L.) Beauv., *Setaria glauca*, *Digitaria ischaemum*, *Solanum nigrum* L., *Conyza canadensis*, *Cuscuta cesatiana* Bertol., *Portulaca oleracea* L., *Anthemis arvensis* L., *Matricaria recutita* L., *Matricaria perforata* Merat, *Consolida orientalis* (J. Gay) Schrödinger, *Consolida regalis* S. F. Gray, *Sisymbrium altissimum* L., *Sisymbrium officinale* (L.) Scop., *Sisymbrium loeselii* L., *Thlaspi arvense* L., *Onopordum acanthium* L., *Phalocroloma annum* (L.) Dumort., *Viola arvensis* Murr., *Lepidium densiflorum* Schrad., *Lepidium perfoliatum* L., *Cynoglossum officinale* L., *Nigella arvensis*

L., *Tribulus terrestris* L., *Hordeum leporinum* Link.) grow up on plots where digression-demotion phenomena caused by zoogenous or anthropogenic influences take place. So-called, unreal explerents (r-strategy) sometimes act as seasonal associate members of specific variants of communities (*Arabidopsis thaliana* (L.) Heynh., *Anisantha tectorum* (L.) Nevski, *Bromus arvensis* L., *Bromus squarrosus* L., *Buglossoides arvensis* (L.) Johnst., *Vicia tetrasperma* (L.) Schreb., *Vicia hirsuta* Gray, *Kochia laniflora* (S. G. Gmel.) Borb., *Centaurea diffusa* Lam., *Thymelaea passerina* (L.) Coss. et Germ.). Some species of perennial herbs (*Asclepias syriaca* L., *Onobrychis viciifolia* Scop., *Solidago gigantea* Ait., *Solidago canadensis* L., *Cardaria draba* (L.) Desv., *Medicago sativa* L., *Artemisia absinthium* L., *Cichorium intybus* L., *Lathyrus tuberosus* L.) are capable of showing the properties of violents (k-strategy) and changing biotopes conditions quite notably within the specified habitats. Their appearance is often associated with invasions of some alien tree species (*Acer negundo* L., *Elaeagnus angustifolia* L., *Morus nigra* L., *Malus sylvestris* Mill., *Prunus divaricata* Ledeb., *Robinia pseudoacacia* L.), as a result of which we observe gradual afforestation of plots and a radical change in the nature of these habitats.

The free-growing non-Mediterranean dry acidophilic and neutrophilic grass communities of the Koelerion glaucae Volk 1931 alliance (E1.9) are characterized by 19 invasive species. Therein certain species of perennial herbs and shrubs (*Asclepias syriaca*, *Amorpha fruticosa*) act as transformers, while the vast majority of annual herbs (*Anisantha tectorum*, *Arabidopsis thaliana*, *Bromus squarrosus*, *Buglossoides arvensis*, *Kochia laniflora*, *Eragrostis pilosa*, *Eragrostis suavelens*, *Eragrostis minor*, *Oenothera rubricaulis* Klebahn, *Conyza canadensis*, *Setaria viridis*, *Setaria glauca*, *Digitaria ischaemum*, *Portulaca oleracea*, *Anthemis arvensis*, *Scleranthus annuus* L., *Tribulus terrestris*) act as co-dominants or assectators.

On the hay-meadows of the plain (E2.2) and on the damp and wet eutrophic and mesotrophic meadows (E3.4) in the communities of the alliances Arrhenatherion elatioris Luquet 1926, Calthion palustris Tx. 1937, Deschampsion cespitosae Horvatix 1930, Molinion caeruleae Koch 1926, Filipendulion ulmariae Segal ex Westhoff and Den Held 1969, 82 alien species have been registered. The populations of most of them are of r-strategy (*Anisantha tectorum*, *Anthemis arvensis*, *Atriplex tatarica*, *Bromus arvensis*, *Bromus commutatus* Schrad., *Bromus secalinus* L., *Bromus squarrosus*, *Buglossoides arvensis*, *Capsella bursa-pastoris* (L.) Medik., *Carduus acanthoides* L., *Conyza canadensis*, *Cynoglossum officinale*, *Digitaria sanguinalis* (L.) Scop., *Echinochloa crus-galli*, *Hordeum leporinum*, *Hordeum murinum* L., *Lactuca serriola*, *Lepidotheca suaveolens* (Pursh) Nutt., *Setaria verticillata*, *Sisymbrium altissimum*, *Sisymbrium loeselii*, *Sisymbrium officinale*, *Thymelaea passerina*, *Verbena officinalis* L., *Viola arvensis*, *Vicia angustifolia* Reichard, *Vicia biennis* L., *Xanthoxalis dillenii* (Jacq.) Holub, *Xanthoxalis fontana* (Bunge) Holub) and occasionally grow on plots, which are characterized by digression-demutation phenomena caused by zoogenous or anthropogenic influences. Certain species of this group are typical representatives of water-meadows (*Arabidopsis thaliana*, *Barbarea stricta* Andrz., *Cucubalus baccifer* L., *Digitaria ischaemum*, *Myosotis arvensis* (L.) Hill, *Oenothera rubricaulis*, *Setaria glauca*, *Setaria viridis*, *Veronica arvensis* L., *Vicia hirsuta*, *Vicia tetrasperma*), while some of them can form long-lived thickets (*Cuscuta campestris* Yunck., *Cuscuta cesatiana*, *Echinocystis lobata*, *Geranium sibiricum* L., *Bidens frondosa*, *Valerianella locusta* (L.) Laterrade, *Phalocroloma annum*). More significant (dominants and co-dominants) and lasting influence on the meadow phytocenoses is produced by such perennial herbs as *Helianthus subcanescens* (A. Gray) E. E.

Wats., *Althaea officinalis*, *Arrhenatherum elatius* (L.) J. and C. Presl, *Artemisia absinthium*, *Asclepias syriaca*, *Aster novae-angliae* L., *Aster salignus* Willd., *Cardaria draba*, *Cichorium intybus*, *Juncus tenuis* Willd., *Lathyrus tuberosus*, *Marrubium vulgare* L., *Medicago sativa*, *Onobrychis viciifolia*, *Petasites hybridus*, *Petasites spurius*, *Saponaria officinalis* L., *Solidago canadensis*, *Solidago gigantea*, *Sonchus arvensis* L. The existence of populations of invasive tree species (*Acer negundo*, *Amorpha fruticosa*, *Elaeagnus angustifolia*, *Fraxinus pennsylvanica* Marsh., *Lycium barbatum* L., *Morus nigra*, *Prunus divaricata*, *Ptelea trifoliata* (L.) Raf., *Quercus rubra* L., *Robinia pseudoacacia*, *Rosa rugosa* Thunb.) means the beginning of complete degradation of meadow coenoses and their overgrowth with shrub and forest vegetation.

In the communities of the *Prunion fruticosae* Tx. 1952 alliance (Pontic-Sarmatian deciduous shrubs – F3.247, 92 alien species have been registered. Occasionally, in the tier of herbs in these phytocenoses such species as *Aethusa cynapium* L., *Anthriscus longirostris* Bertol., *Cardaria draba*, *Chenopodium suecicum* J. Murr, *Cuscuta cesatiana*, *Cuscuta campestris*, *Dipsacus laciniatus* L., *Dipsacus pilosus* L., *Dipsacus strigosus* Willd. ex Roem. et Schult., *Geranium dissectum* L., *Hyoscyamus niger* L., *Lamium amplexicaule* L., *Lathyrus tuberosus*, *Leonurus cardiaca* L., *Lepidium perfoliatum*, *Marrubium vulgare*, *Onobrychis viciifolia*, *Reseda lutea* L., *Senecio viscosus* L., *Senecio vulgaris* L., *Stellaria neglecta* Weihe grow. Quite often, the components of the grass layer are the following: *Anisantha tectorum*, *Anthemis arvensis*, *Arabidopsis thaliana*, *Arrhenatherum elatius*, *Artemisia absinthium*, *Ballota nigra* L., *Bromus arvensis*, *Bromus squarrosus*, *Buglossoides arvensis*, *Bunias orientalis* L., *Capsella bursa-pastoris*, *Carduus acanthoides*, *Chelidonium majus* L., *Cichorium intybus*, *Conium maculatum* L., *Conyza*

canadensis (L.) Cronq. *Consolida regalis*, *Cucubalus baccifer*, *Cynoglossum officinale*, *Descurainia sophia* (L.) Webb ex Prantl, *Fallopia convolvulus* (L.) A. Love, *Fumaria officinalis* L., *Geranium pusillum* L., *Hordeum leporinum*, *Impatiens parviflora* D. C., *Kochia laniflora*, *Lactuca serriola*, *Lamium purpureum* L., *Lappula squarrosa*, *Lepidium densiflorum*, *Lepidotheca suaveolens*, *Myosotis arvensis*, *Oenothera rubricaulis*, *Onopordum acanthium*, *Phalocroloma annum*, *Portulaca oleracea*, *Saponaria officinalis*, *Setaria glauca*, *Setaria verticillata*, *Setaria viridis*, *Sisymbrium altissimum*, *Sisymbrium loeselii*, *Sisymbrium officinale*, *Solanum nigrum*, *Vicia tetrasperma*, *Viola arvensis*. These communities are also characterized by a large list of shrubs, trees and lianas (*Acer negundo*, *Caragana arborescens* Lam., *Cerasus vulgaris* Mill., *Cotinus coggygria* Scop., *Elaeagnus angustifolia*, *Fraxinus pennsylvanica*, *Grossularia reclinata* (L.) Mill., *Juglans regia* L., *Lonicera tatarica* L., *Lycium barbatum*, *Malus sylvestris*, *Morus nigra*, *Padus serotina* (Ehrh.) Ag., *Partenocissus quinquefolia* (L.) Planch., *Phellodendron amurense* Rupr., *Physocarpus opulifolius* (L.) Maxim., *Prunus divaricata*, *Ptelea trifoliata*, *Quercus rubra*, *Rhus typhina* L., *Robinia pseudoacacia*, *Rosa rugosa*, *Sorbaria sorbifolia* A. Br., *Syringa vulgaris* L.).

In the communities of the *Salicetalia purpureae* Moor 1958 order (riverside shrubs – F9.1 and willow forests – G1.11) 58 alien species have been recorded. In the tier of herbs of these communities, the following are rarely found: *Althaea officinalis*, *Anthemis arvensis*, *Arabidopsis thaliana*, *Anthriscus longirostris*, *Cuscuta campestris*, *Cuscuta cesatiana*, *Cynoglossum officinale*, *Digitaria ischaemum*, *Echinocystis lobata*, *Marrubium vulgare*. Also, here quite often are growing *Anisantha tectorum*, *Artemisia absinthium*, *Asclepias syriaca*, *Ballota nigra*, *Bidens frondosa*, *Chelidonium majus*, *Chenopodium hybridum* L., *Chenopodium suecicum*, *Conyza*

canadensis, *Cucubalus baccifer*, *Echinochloa crus-galli*, *Eragrostis minor*, *Eragrostis pilosa*, *Eragrostis suavelens*, *Fallopia convolvulus*, *Impatiens parviflora*, *Kochia laniflora*, *Lactuca serriola*, *Lamium amplexicaule*, *Lamium purpureum*, *Lappula squarrosa*, *Myosotis arvensis*, *Oenothera rubricaulis*, *Petasites spurius*, *Phalocroloma annum*, *Portulaca oleracea*, *Setaria glauca*, *Setaria viridis*, *Solanum nigrum*, *Sonchus arvensis*, *Veronica arvensis*, *Vicia hirsuta*, *Vicia tetrasperma*, *Viola arvensis*, *Xanthium albinum*, *Xanthoxalis dillenii*, *Xanthoxalis fontana*. Occasionally, alien dendroflora is represented here by *Celtis occidentalis* L., *Cerasus vulgaris*, *Clematis vitalba* L., and widespread *Acer negundo*, *Amorpha fruticosa*, *Elaeagnus angustifolia*, *Fraxinus pennsylvanica*, *Malus sylvestris*, *Morus nigra*, *Partenocissus quinquefolia*, *Prunus divaricata*, and *Robinia pseudoacacia*.

In the communities of damp and wet forests of *Alnion incanae* Pawiowski et al. 1928, *Carpinion betuli* Issler 1931, alliances (periodically inundated wet forests with the domination of *Alnus* or *Fraxinus* – G1.21 and with the domination of *Quercus*, *Ulmus* and *Fraxinus* – G1.22) 32 alien species have been recorded. In the region the following taxa are widely distributed: *Acer negundo*, *Amorpha fruticosa*, *Ballota nigra*, *Bidens frondosa*, *Cucubalus baccifer*, *Fallopia convolvulus*, *Impatiens parviflora*, *Malus sylvestris*, *Myosotis arvensis*, *Phalocroloma annum*, *Robinia pseudoacacia*, *Solanum nigrum*, but most of the alien species have only a local distribution here: *Aethusa cynapium*, *Dipsacus pilosus*, *Dipsacus strigosus*, *Echinocystis lobata*, *Fraxinus pennsylvanica*, *Grossularia reclinata*, *Impatiens glandulifera* Royle, *Lamium amplexicaule*, *Lamium purpureum*, *Lappula squarrosa*, *Marrubium vulgare*, *Morus nigra*, *Partenocissus quinquefolia*, *Sonchus arvensis*, *Sonchus asper* L., *Sonchus oleraceus* L., *Veronica arvensis*, *Vinca minor* L., *Xanthoxalis dillenii*, and *Xanthoxalis fontana*.

In the communities of dry thermophilic forests of the *Aceri tatarici-quercion* Zilyomi 1957 alliance (G1.7) 28 alien species have been registered (*Aethusa cynapium*, *Amorpha fruticosa*, *Anisantha tectorum*, *Anthemis arvensis*, *Arabidopsis thaliana*, *Armeniaca vulgaris* Lam., *Artemisia absinthium*, *Ballota nigra*, *Bromus squarrosus*, *Buglossoides arvensis*, *Caragana arborescens*, *Chelidonium majus*, *Cichorium intybus*, *Conyza canadensis*, *Cucubalus baccifer*, *Cynoglossum officinale*, *Impatiens parviflora*, *Lonicera tatarica*, *Malus sylvestris*, *Phalocroloma annum*, *Portulaca oleracea*, *Prunus divaricata*, *Ptelea trifoliata*, *Robinia pseudoacacia*, *Vicia hirsuta*, *Vicia tetrasperma*, *Vinca minor*, and *Viola arvensis*). Probably, such an insignificant number of them is connected with the minor distribution of these communities in the researched region and our lack of information about them.

In the forest communities dominated by *Quercus robur* Sol., *Fraxinus excelsior* L. and *Carpinus betulus* L. on eutrophic and mesotrophic soils (G1.A1 – alliance *Carpinion betuli*) 31 alien species have been recorded. A relatively small number of them are obviously determined by the high resistance of these biotopes to invasions of alien species. Such taxa as *Aethusa cynapium*, *Amorpha fruticosa*, *Hyoscyamus niger*, *Dipsacus strigosus*, *Lamium amplexicaule*, *Lamium purpureum* can be observed occasionally. As casual assectators of corresponding tiers the next species

CONCLUSIONS

Thus, in the habitats proposed for conservation in Europe, which are also typical of the Pridniprovsk Left-Bank Forest-Steppe, 277 alien species have been recorded. The 31 species which have a rather wide coenotic range in the region (*Acer negundo*, *Amorpha fruticosa*, *Anisantha tectorum*, *Anthemis arvensis*, *Arabidopsis thaliana*, *Artemisia absinthium*, *Ballota nigra*, *Bidens*

grow relatively often: *Acer negundo*, *Anisantha tectorum*, *Artemisia absinthium*, *Ballota nigra*, *Bidens frondosa*, *Bromus squarrosus*, *Buglossoides arvensis*, *Cucubalus baccifer*, *Lactuca serriola*, *Lappula squarrosa*, *Malus sylvestris*, *Phalocroloma annum*, *Phellodendron amurense*, *Portulaca oleracea*, *Prunus divaricata*, *Ptelea trifoliata*, *Quercus rubra*, *Robinia pseudoacacia*, *Veronica arvensis*, *Xanthoxalis dillenii*, and *Xanthoxalis fontana*. In the quality of dominants and co-dominants of a grass layer *Chelidonium majus*, *Falopia convolvulus*, *Impatiens parviflora*, *Vinca minor* are widely spread.

In dry thermophilic pine forests of the *Festuco-Pinion sylvestris* Passarge 1968 union (Sarmatian steppic forests *Pinus sylvestris* – G3.4232) 28 alien species have been found (*Anisantha tectorum*, *Anthemis arvensis*, *Arabidopsis thaliana*, *Atriplex tatarica*, *Ballota nigra*, *Bromus squarrosus*, *Buglossoides arvensis*, *Chelidonium majus*, *Chenopodium suecicum*, *Conyza canadensis*, *Digitaria ischaemum*, *Digitaria sanguinalis*, *Eragrostis minor*, *Eragrostis pilosa*, *Eragrostis suavelens*, *Falopia convolvulus*, *Impatiens parviflora*, *Kochia laniflora*, *Oenothera rubricaulis*, *Phalocroloma annum*, *Pinus banksiana* Lamb., *Portulaca oleracea*, *Robinia pseudoacacia*, *Scleranthus annuus*, *Senecio vulgaris*, *Setaria glauca*, *Setaria viridis*, and *Solanum nigrum*). All of them grow only locally, without playing a particularly prominent role. Relatively small numbers and such a low-profile role are apparently defined by the inconsistency of these ecotypic conditions for them.

frondosa, *Bromus squarrosus*, *Buglossoides arvensis*, *Chelidonium majus*, *Cichorium intybus*, *Conyza canadensis*, *Cucubalus baccifer*, *Cynoglossum officinale*, *Digitaria ischaemum*, *Impatiens parviflora*, *Kochia laniflora*, *Lactuca serriola*, *Malus sylvestris*, *Morus nigra*, *Oenothera rubricaulis*, *Phalocroloma annum*, *Portulaca oleracea*, *Prunus divaricata*, *Robinia pseudoacacia*, *Setaria glauca*,

Setaria viridis, *Vicia tetrasperma*, *Xanthoxalis dillenii*, and *Xanthoxalis fontana*), are typically widespread in five or more types of such habitats. 33 alien species (*Acer negundo*, *Acorus calamus*, *Amorpha fruticosa*, *Anisantha tectorum*, *Anthemis arvensis*, *Arrhenatherum elatius*, *Artemisia absinthium*, *Asclepias syriaca*, *Ballota nigra*, *Bidens frondosa*, *Bromus squarrosus*, *Chelidonium majus*, *Cichorium intybus*, *Conyza canadensis*, *Echinocystis lobata*, *Elaeagnus angustifolia*, *Elodea canadensis*, *Elodea nuttallii*, *Helianthus*

subcanescens, *Hordeum leporinum*, *Impatiens parviflora*, *Padus serotina*, *Partenocissus quinquefolia*, *Petasites hybridus*, *Petasites spurius*, *Phalocroloma annum*, *Quercus rubra*, *Robinia pseudoacacia*, *Rosa rugosa*, *Solidago canadensis*, *Solidago gigantea*, *Vinca minor*, and *Zizania latifolia*) possess the ability to dominate and play a role in influencing the structure of certain habitats, thus causing their gradual transformation.

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