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New perspective objects for inclusion in the nature reserve network of the Kharkov region

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The paper deals with the necessity of creating new nature protected areas in the valley of Seversky Donets river to protect and preserve the vegetation cover of reservoirs and to increase the representativeness of the region's biodiversity. The research is based on the results of field investigations of higher aquatic vegetation in the valley of Seversky Donets river that have been made by the author during 2010–2016. A brief description of the current state of Nature Conservation Fund of the valley of Seversky Donets river in Kharkov region has been given. The author points out the publications of other authors devoted to botanical researches of these territories. As new nature protected objects, there are proposed: botanical reserve of national importance “Ozero Zymnje” (Zymnje Lake) and hydrological reserve of national importance “Ust'e reki Mzha” (Estuary of Mzha river). This paper provides information about the location of the objects with GPS coordinates, a brief description of hydrological, geological, climatic conditions, the soil cover, and vegetation. In this paper, the type and category of proposed objects have been determined. Separately, the author notes the presence of rare species and rare plant communities, included in the relevant documents on environmental and vegetable world protection. The main threats to the normal functioning of nature ecosystems have been indicated. Location maps and schematic maps of vegetation with indicating the habitats of rare plants species accompany the materials about the proposed new nature protected areas.

Key words: *higher aquatic vegetation, rare plant species and communities, Nature Conservation Fund, valley of Seversky Donets river, Kharkov region.*

Нові перспективні об’єкти для включення у природно-заповідну мережу Харківської області

Г.О.Казарінова

У роботі обґрунтовується необхідність створення нових природоохоронних територій у долині р. Сіверський Донець з метою охорони та збереження рослинного покриву водойм, підвищення репрезентативності біорізноманіття регіону. Матеріалами слугують результати польових досліджень вищої водної рослинності долини р. Сіверський Донець, виконані автором протягом 2010–2016 рр. Наводиться коротка характеристика сучасного стану природно-заповідного фонду долини Сіверського Дінця в Харківській області. Наводяться публікації інших авторів, присвячені ботанічним дослідженням даних територій. В якості нових природоохоронних об’єктів пропонуються: ботанічний заказник загальнодержавного значення «Озеро Зимнє» та гідрологічний заказник загальнодержавного значення «Гирло річки Мжа». У статті надається інформація про розташування даних об’єктів із зазначенням GPS координат, коротка характеристика гідрологічних, геологічних, кліматичних умов, ґрунтового покриву, рослинності. Визначено тип і категорію запропонованих об`єктів. Окремо відмічається наявність рідкісних видів та раритетних рослинних угруповань, які занесені до відповідних охоронних документів. Наведені основні фактори, які загрожують нормальному функціонуванню природних екосистем. Матеріали по запропонованим новим природоохоронним територіям супроводжуються картами їх розташування та картосхемами рослинного покриву із зазначенням місцезростань рідкісних видів рослин.

Ключові слова: *вища водна рослинність, рідкісні види рослин та угруповань, природно-заповідний фонд, долина р. Сіверський Донець, Харківська область.*

Новые перспективные объекты для включения в природно-заповедную сеть Харьковской области

А.О.Казаринова

В работе обосновывается необходимость создания новых природоохранных территорий в долине р. Северский Донец с целью охраны и сохранения растительного покрова водоемов, повышение репрезентативности биоразнообразия региона. Материалами служат результаты полевых

исследований высшей водной растительности долины р. Северский Донец, выполненные автором в течение 2010–2016 гг. Приводится краткая характеристика современного состояния ПЗФ долины Северского Донца в Харьковской области. Указываются публикации других авторов, посвященные ботаническим исследованиям данных территорий. В качестве новых природоохранных объектов предлагаются: ботанический заказник общегосударственного значения «Озеро Зимнее» и гидрологический заказник общегосударственного значения «Устье реки Мжа». В статье предоставляется информация о расположении данных объектов с указанием GPS координат, краткая характеристика гидрологических, геологических, климатических условий, почвенного покрова, растительности. Определен тип и категория предлагаемых объектов. Отдельно отмечается наличие редких видов и раритетных растительных сообществ, которые занесены в соответствующие охранные документы. Приведены основные факторы, угрожающие нормальному функционированию природных экосистем. Материалы по предложенным новым природоохранным территориям сопровождаются картами их расположения и картосхемами растительного покрова с указанием местообитаний редких видов растений.

Ключевые слова: *высшая водная растительность, редкие виды растений и сообществ, природно-заповедный фонд, долина р. Северский Донец, Харьковская область.*

Introduction

The valley of Seversky Donets river, which is the largest river in eastern Ukraine, has high levels of landscape and biological diversity. The high industrialization and urbanization of the region leads to the transformation of natural ecosystems and the fragmentation of their vegetation. The scientific value and the necessity to preserve typical and rare natural habitats, species and biocenoses condition the search of an effective methods of their conservation and sustainable using.

The Nature Conservation Fund (NCF) of Kharkov region includes 220 objects with the total area of 52943.9 hectares, representing 1.69% of the total area of Kharkov region (Klimov et al., 2005). The net of nature protected areas of the valley of Seversky Donets river in Kharkov region has 35 objects including National Nature Park “Homilshanski Lisy” (14314.8 hectares), two regional landscape parks – “Pecheneg Field” (4997.6 hectares) and “Iziumska Luka” (2560 hectares), 25 reserves (4 – national and 21 – local importance), 4 reserve natural boundaries and 3 natural landmarks (Klimov et al., 2005; Phytodiversity…, 2012). The protection level of vegetation of reservoirs is insufficient in the studied region.

Cenotic diversity of higher aquatic vegetation differs an average degree of representation in protected areas and low protection level (about 27%). At the same time, the aquatic communities are very vulnerable because of increasing anthropogenic influence and transformation of ecosystems in the catchment areas (Dubyna et al., 1993). Considering the uniqueness, peculiarity of components and scientific value of wetlands that are in crisis state, the regional aquatic vegetation needs protection. The small number of phytosozological works devoted to this issues causes concern (Chernaya, 1979, 1982; Chorna, 1978, 2001; Dubyna, Chorna, 1984; Dubyna et al., 1985; Gorelova, 1995; Kazarinova, 2011, 2013a-c, 2014; Prokudin, Matvienko, 1987). Botanical researches of proposed objects have been reflected in individual publications (Brezgunova, 2011; Gorbulin, 1995). The aim of this work is to prove the necessity for inclusion of the reservoirs to the NCF of Kharkov region through the creation of new protected areas.

Materials and methods

In preparing the materials for the creation of protected areas a comprehensive assessment of the scientific, environmental, cognitive, recreational, historical, cultural and other values of the object has been conducted. The level of stability of natural ecosystems to anthropogenic pressure and possible threat to their existence because of different types and regimes of nature management has been determined (Directory of Ukraine's Wetlands, 2006). In developing the practical methods of protection of hydrological objects we have to take into account their ecological characteristics, type of reservoirs (lakes, river systems) and protected communities, the state, which they are in at present, and the level of degradation. As a result of this comprehensive assessment the category, type of the object have been determined and its individual plan of protection has been formed. The mapping of rare plant species has been conducted using point method by placing locations of species on schematic map. The maps have been made in the scale 1: 5 000 and 1: 30 000. The geobotanical descriptions of higher aquatic vegetation of the valley of Seversky Donets river and the interactive satellite pictures have been served as starting material.

Results and discussion

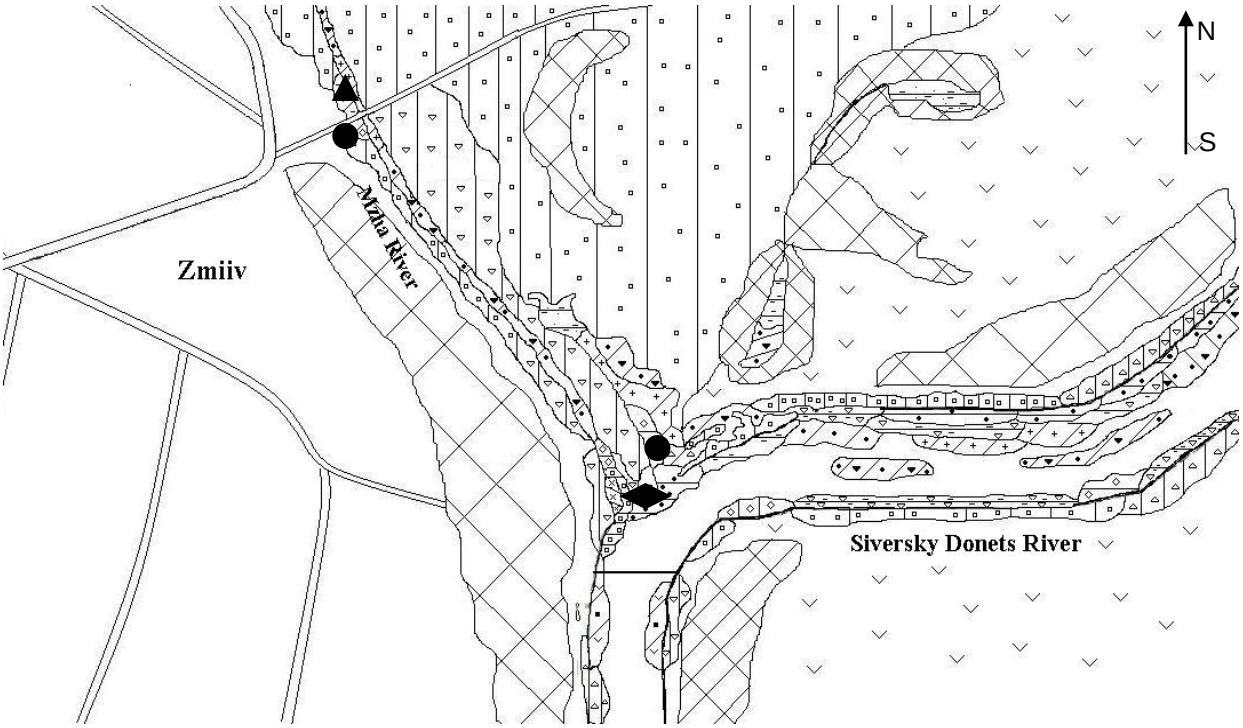
In order to preserve aquatic vegetation and to increase the representativeness of the region's biodiversity we propose to create two new protected objects: botanical reserve of national importance “Ozero Zymnje” (Zymnje Lake) (outskirts of village Donets, Balakleyskiy district, Kharkov region) and hydrological reserve of national importance “Ust'e reki Mzha” (Estuary of the river Mzha) (suburb of Zmiiv city, Kharkiv region).

The territory that is offered to create hydrological reserve of national importance “Ust'e reki Mzha” covers the area of the confluence of Mzha river in Seversky Donets river. The area of the proposed object is 10 hectares, location: Zmiiv city, Kharkov region. GPS coordinates: 49°40'21.8"N, 36°21'58.2"E. Figure 1 shows the location map of the studied territory.

Fig. 1. The location map of the proposed hydrological reserve of national importance “Ust'e reki Mzha” (Estuary of the river Mzha)

According to the physical-geographic zoning of Ukraine, the territory is located on the edge of Kharkov highland forest-steppe of the East-Ukrainian forest-steppe land of the forest-steppe zone and Starobilsk slope-highland region of Zadonetsk-Donsk northernsteppe land of the steppe zone. According to the geobotanical zoning of Ukraine, it is located on the edge of Kharkov district of oak, lime-oak forests and meadow steppes of Central Russian forest-steppe subprovince of Eastern European forest-steppe province of oak forests, steppe grasslands and meadow steppes and Samara left-bank district of forb-grass steppes, ravine forests and salt grasslands of Black Sea-Azov steppe subprovince of Pontian steppe province. The area is located in Mzhansky geomorphological district of Kharkov region, where the main element of a relief is valleys of rivers Mzha and Seversky Donets. According to hydrological conditions, this area covers the mouth of the river Mzha that has a wide waterlogged floodplain. By the water regime Seversky Donets and its inflows belong to the rivers of Eastern European type that are characterized by a high spring flood, small summer and autumn high water and prolonged summer and winter low water. The main power source is atmospheric precipitation and groundwater (Severskо-Donetskiy…, 1980). Geologically the territory is characterized by friable rocks, mainly loess loam and alluvial sands. Only on the slopes of river valleys and ravines there are outs of variegated clays, white sands of Neogene and greenish-yellowish friable sandstones, fine-grained and clayish sands of Paleogene (Kharkov region…, 1997). The climate of this territory corresponds to the temperate continental with unstable temperature conditions. Average monthly temperature of January is -6,6°C, of

July – +21,5°C, annual precipitation – 475–500 mm with a maximum in June. The soil cover of this area is represented by podzolized forest-steppe soils and sod-podzolic and sod sandy soils of a pine forest terrace (Kharkov region…, 1971). The vegetation cover of the proposed territory is represented by meadow, marsh, higher aquatic vegetation. Submerged and floating higher aquatic vegetation compose of communities *Lemnetum minoris*, *Lemno minoris-Salvinietum natantis*, *Hydrocharitetum morsus-ranae, Myriophyllo-Nupharetum*, *Potametum natantis*, *Ceratophylletum demersi*, *Najadetum marinae, Myriophylletum verticillati*. As a part of air-aquatic vegetation there are dominate *Phragmitetum australis*, *Typhetum angustifoliae*, *Typhetum latifoliae*, *Schoenoplectetum lacustris*, *Glycerietum maximae*, *Acoretum calami*. Figure 2 shows the schematic map of vegetation of studied area.



Scale 1: 5 000

Fig. 2. The schematic map of vegetation cover of the proposed hydrological reserve of national importance "Ust'e reki Mzha" (Estuary of the river Mzha)
Habitats: ● – *Stratiotes aloides*; ▲ – *Utricularia vulgaris*; ◆ – *Potamogeton pusillus*.

At the area of proposed reserve the localities of five rare plant species listed in the Red Book of Ukraine, Red List of aquatic macrophytes of Ukraine, Red List of Plants of Kharkov region have been identified (*Salvinia natans* (L.) All., *Nuphar lutea* (L.) Smith, *Stratiotes aloides* L., *Utricularia vulgaris* L., *Vallisneria spiralis* L.). According to the results of algological researches, this territory is also characterized by a large number of finds of new and rare species of algae (Gorbulin, 1995). The proposed for conservation territory covers the estuary of Mzha river and coastal areas of Severskiy Donets, on which there are rare species and communities, including *Lemno minoris-Salvinietum natantis*, *Myriophyllo-Nupharetum*, *Lemno-Utricularietum*, *Acoretum calami*. The habitat of *Potametum pusilli* communities is also marked here. Among of rare communities, formations of *Salvinieta natantis, Nuphareta luteae, Sagittarieta sagittifoliae* are listed in the Green Book of Ukraine, formation of *Acoreta calami* is listed in Green list of Kharkov region. The main factors of human influence are eutrophication of reservoirs, sewage pollution, excessive recreational activities. In this area the spread of alien thermophilic communities *Potameto perfoliati-Vallisnerietum spiralis* has been marked. The object is proposed to provide the reserve status with partial protection regime, because it is able to protect the habitats of rare species and facilitate the monitoring of the state of their populations. In connection with a location of this

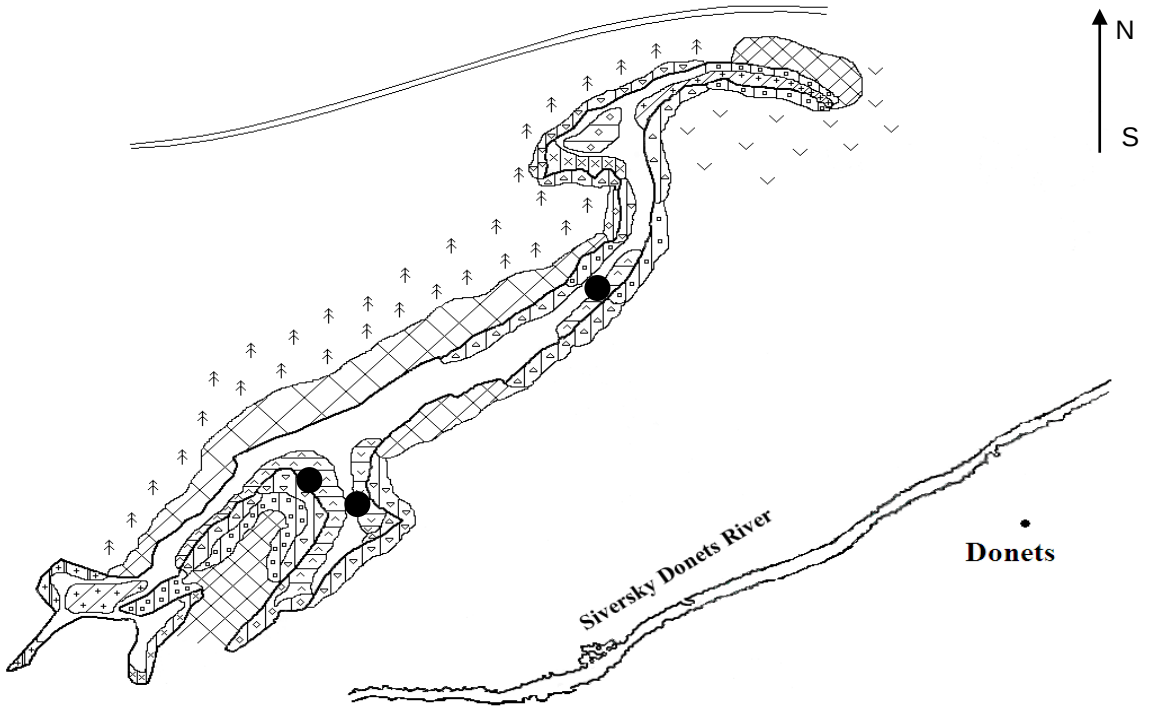
territory at the intersection of Severskо-Donetsky and Galicia-Slobozhansky ecological corridors it has been recommend to create a hydrological reserve of national importance.

The proposed botanical reserve of national importance “Ozero Zymnje” (Zymnje Lake) is located on the left bank of Seversky Donets river. The area of the object is 40 hectares, location: outskirts of village Donets, Balakleyskiy district, Kharkov region. GPS coordinates: 49°31'22"N 36°33'24.8"E. Figure 3 shows the location map of studied territory. According to the physical-geographic zoning of Ukraine, the territory is located in Starobilsk slope-highland region of Zadonetsk-Donsk northernsteppe land of the steppe zone. According to the geobotanical zoning of Ukraine, it is located in Samara left-bank district of forb-grass steppes, ravine forests and salt grasslands of Black Sea-Azov steppe subprovince of Pontian steppe province. The area is located in Donetsk terraced geomorphological district of Kharkov region or Donetsk alluvial plain. According to the origin and hydrological conditions the reservoir is floodplain lake, which is located on the second pine forest terrace of left gentle slope of Seversky Donets river. Geologically the territory is sandy terrace, built of river (ancient alluvial) sands that form hilly landscape. The modern floodplain alluvial deposits (a silty-sand mixture), that are formed during the flood, lie on the surface of floodplain (Kharkov region…, 1997). The climate indicators correspond to the temperate continental conditions specified in the description of the previous object. The soil cover of this area is represented by sod-podzolic and sod sandy soils of a pine forest terrace (Kharkov region…, 1971). The vegetation of this territory is represented by typical aquatic, marsh, meadow and forest (floodplain forests, pine forests) cenoses. Submerged and floating higher aquatic vegetation of floodplain lake are formed by cenoses *Lemno minoris-Hydrocharitetum morsus-ranae*, *Ceratophylletum demersi*, *Nymphaeo albae-Nupharetum luteae*, *Nymphaeetum candidae*. Among of air-aquatic cenoses there are dominate *Phragmitetum australis*, *Typhetum angustifoliae*, *Typhetum latifoliae*, *Schoenoplectetum lacustris*, *Acoretum calami*, *Cicuto-Caricetum pseudocyperi*.

Fig. 3. The location map of the proposed botanical reserve of national importance “Ozero Zymnje” (Zymnje Lake)

Figure 4 shows the schematic map of vegetation of studied territory. At the area of proposed reserve the localities of five rare plant species listed in the Red List of aquatic macrophytes of Ukraine, Red List of Plants of Kharkov region have been identified (*Nymphaea candida* J. et C. Presl., *Nymphaea alba* L., *Nuphar lutea* (L.) Smith, *Ceratophyllum submersum* L., *Carex pseudocyperus* L.). The proposed

for conservation territory covers the floodplane lake of left bank of Seversky Donets river. The one of the southernmost surviving habitats of rare communities of formation *Nymphaeeta candidae*, located on the edge of their distribution, has been represented here. This territory also represents rare communities of formations *Nymphaeeta alba*, *Nuphareta luteae*, listed in the Green Book of Ukraine and communities of formation *Acoreta calami*, listed in the Green list of Kharkov region. The main factors of human influence are eutrophication of reservoirs, excessive recreational activities. The object is proposed to provide the reserve status with partial protection regime, because it is able to protect the habitats of rare species and facilitate the monitoring of the state of their populations. Considering the high scientific value of this object it is proposed to create a botanical reserve of national importance.



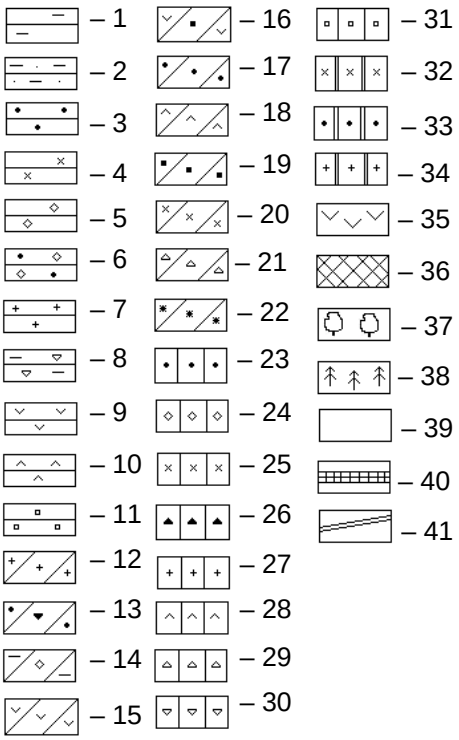
Scale 1: 30 000

Fig. 4. The schematic map of vegetation cover of the proposed botanical reserve of national importance "Ozero Zymnje" (Zymnje Lake)
Habitats: ● – *Nymphaea candida*.

Conclusions

As a result of conducted geobotanical researches it has been proposed to create two new nature protected objects to protect and preserve the vegetation cover of reservoirs and to increase the representativeness of biodiversity of Kharkov region. The complete protection can`t be ensured only by implementing the reserve regime. To optimize the vegetation cover of reservoirs it is also necessary to implement integrated environmental protection measures, including improving the regulatory framework, environmental education, science-based approach in the system of landscape planning actions (ecologically reasonable placing of large industrial and agricultural objects, planning of activities of territorial organization of landscapes), system of active and passive phytosozological activity etc. (Dubyna et al., 1993). Such actions will allow increasing the percentage of protected areas in the region, expanding the nature reserve network and connecting key areas of Seversko-Donetsky meridional ecological corridor of national ecological network of Ukraine.

Legend to Fig. 2, 4:



Higher aquatic vegetation: 1 – *Lemnetum minoris*; 2 – *Spirodeletum polyrrhizae*; 3 – *Lemno minoris-Salvinietum natantis*; 4 – *Lemnetum gibbae*; 5 – *Lemno minoris-Hydrocharitetum morsus-ranae*; 6 – *Salvinio-Hydrocharitetum*; 7 – *Lemnetum trisulcae*; 8 – *Pistia stratiotes* community; 9 – *Nymphaeo albae-Nupharetum luteae*; 10 – *Nymphaeetum candidae*; 11 – *Potametum natantis*; 12 – *Ceratophylletum demersi*; 13 – *Myriophyllo-Nupharetum*; 14 – *Lemno-Utricularietum*; 15 – *Potametum perfoliati*; 16 – *Potameto perfoliati-Vallisnerietum spiralis*; 17 – *Myriophylletum verticillati*; 18 – *Potametum pectinati*; 19 – *Potametum crispi*; 20 – *Potametum pusilli*; 21 – *Najadetum marinae*; 22 – *Elodeetum canadensis*; 23 – *Glycerietum maximae*; 24 – *Acoretum calami*; 25 – *Schoenoplectetum lacustris*; 26 – *Bolboschoenetum maritimi*; 27 – *Sparganietum erecti*; 28 – *Butometum umbellati*; 29 – *Typhetum latifoliae*; 30 – *Typhetum angustifoliae*; 31 – *Phragmitetum australis*; 32 – *Sagittario sagittifoliae-Sparganietum emersi*; 33 – *Carici acutae-Glycerietum maximae*; 34 – *Cicuto-Caricetum pseudocyperi*.

Meadow vegetation: 35 – swampy meadows (*Molinio-Arrhenaterethea*).

Forest vegetation: 36 – floodplain forests (*Alnetea glutinosae, Salicetea purpureae*); 37 – upland oak forests (*Querco-Fagetea*); 38 – pine forests (*Vaccinio-Piceetea*).

39 – the water area with sparse single communities; 40 – the railway; 41 – the road.

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