8th European Dry Grassland Meeting

Dry Grassland of Europe: biodiversity, classification, conservation and management

13-17 June 2011, Uman', Ukraine

Abstracts & Excursion Guides

Edited by Anna Kuzemko

National Academy of Sciences of Ukraine, Uman' Ukraine
National Dendrological Park “Sofiyivka”

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Figure on the cover page: *Stipa capillata* (Ivan. I. Moysienko)

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Contents

Abstracts

DETERMINATION OF SOME CHARACTERS OF GRASS PEA (*Lathyrus sativus* L.) POPULATIONS CULTIVATED IN DIFFERENT PARTS OF TURKEY

Zeki Acar[1], Ugur Basaran[2], Ilknur Ayan[1], Hanife Mut[2] & Ozlem O. Asci[3]

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Lathyrus genus includes annual and perennial 160 species. In flora of Turkey, there are 58 naturally grown *Lathyrus* species and, 18 of them are endemic. Agriculturally important *Lathyrus* species are *L.sativus, L. cicera, L. ochrus, L. hirsutus, L. tigitanus, L. latifolius, L.sylvestris*, *L. clymenum* and they were used as forage and grain principally for animal feed and, particularly *L. sativus ,* as human food. The most cultivated *Lathyrus* species is *L. sativus* which has many agricultural advantages. This species can grow even under 250 mm annual rainfall. So, *L. sativus* is one of the most popular crop which is resistant to drought. In Anatolia, although *Lathyrus sativus* L. has been cultivated for a long time there is only one released cultivar (Gurbuz 2001). In last years, local population numbers decreased rapidly due to different reasons. For *Lathyrus* cultivation, local populations are used in the country and, agricultural characters and Я-ODAP (Я- N-*oxalyl*-*L*-α,Я-diaminopropionic acid) content of these populations are not known.

In this study, *52 L. sativus* genotypes, 51 of them local populations collected from different parts of Turkey and one is released cultivar were investigated in terms of their general agricultural features and Я-ODAP contents. Experiment was performed in Samsun ecological conditions during 2007-2008 and 2008-2009 vegetations periods. As an average of two years, it was determined that the beginning of flowering was recorded between 159.5-175.0 days and mean 166 days, a period from sowing to harvest occured between 230-243.5 days and mean 235.6 days among *L. sativus* genotypes . Among *L. sativus* genotypes, as morphological and agricultural characters, plant height, pod number per plant, seed yield per plant, 1000 seed weight, crude protein content of seed, Я-ODAP content in seed were figured out between 30.14 and 56.00 cm; 14.40 - 45.00; 4.58 - 15.59 g; 79.93 -152.13 g; 21.96-25.04 %; 1.40-3.05 mg/g,respectively. Their means were also found as 37.00 cm, 25.61, 9.33 g, 112.06 g, 23.58 %, 1.96 mg/g, respectively.

As a result, there is high variation among 52 *L. sativus* genotypes and, many of populations are superior to released cultivar (Gurbuz 2001) regarding investigated traits. In addition, intra-population variation was observed in all investigated populations including released species. And also, Я-ODAP content of the populations were under 2.2 mg/g, which means that most of the populations were at safe using limits.

EFFECTS OF DIFFERENT GRAZING RATES ON PLANT STRUCTURE VARIATIONS IN THE MOUNTAIN GRASSLANDS (CASE STUDY CHARBAGH RANGELANDS)

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From ecological view, understanding animal grazing effects on vegetation structure and rangeland ecosystems change caused by grazing is essential. The study area is located in Alborz mountain North of Iran. Charbagh is located between latitude of 36°38`27" to 36°40`30"N and longitude 54°31`48" to 54°33`36"E. The elevation ranges between 2100-3150 m a.s.l. The climate is cold semi-steppe with a mean rainfall of 400 mm y-1. The dominant are grasses and cushion like species such as *Festuca ovina* and *Onobrychis cornuta*. For assessing animal grazing effect on vegetation structure, based on livestock distribution and grazing threats of livestock's concentration. With the different stocking rate were evaluated. Three land units were selected and were randomly 30 sampled by using 1 m2 plots on each site established. To find the plant composition under distribution and grazing methods, canopy coverage of different life forms and plant species were measured and analyzed by using the CA ordination technique. Result show that there was substantial difference between none-grazing (12 years exclusure) with other sites. Total canopy cover was 82.6 % and forbs and hemi-cryptophytes were more than other life forms and palatability species are dominants. Although most of species are forbs and grasses but management and utilization methods was directly affected on plant structure as so shrubs replacing in the overgrazing sites. Also in the overgrazing condition invader plants dominated on decreasers and increasers.

DESERT STEPPES OF THE CRIMEA AND THEIR PRESERVATION

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The question on a current state, level of biological and landscape variety of steppe zone of Ukraine and Crimea is actual because of a number of features this zone practically everywhere has undergone strong transformation as a result of intensive agricultural use. There are almost all basic types of steppes in Crimea: meadow (in a mountain part), presents, desert, sandy (in a flat part) with their typical and petrophytic subtypes. Desert steppes with domination of *Artemisia taurica* Willd. occupy northern part of the Crimean plain which includes the coast of the Karkinitsky gulf, Prisivashye, coast of Azov and Black Seas on the Kerchensky Peninsula. They are coincided dark-chestnut soils in a complex with salty soils. On the large part of territory they have been cultivated. The greatest influence on ecosystems is rendered by irrigation and intensive pasturable cattle breeding. Syntaxonomy of communities of desert steppe of Crimea practically is not developed. We have allocated 5 associations (*Stipetum lessingianae* Soo (1927) 1947 *Festucetum rupicolae* Soy 1940, *Stipetum capillatae* Dziubaltowski 1925, *Festuco valesiacae-Stipetum capillatae* Sill. 1937, *Achilleo setaceae-Poetum angustifoliae* Marjuschkina & V.Solomakha 1986) from alliance *Festucion valesiacae* Klika 1931, order *Festucetalia valesiacae* Br.-Bl. & R.Tx. 1943, class *Festuco-Brometea* Br.-Bl. & R.Tx. 1943 on the basis of preliminary study in 1997-1998, 2000-2004. The flora includes more than 340 taxa, 70% from them belongs to synantropic species, 55 species are alien. However, in despite of considerable transformation of territories, natural complexes have preserved on continental islands and separate fragments - on coast of Sivash-Lake. More than 30 rare and endangered species grow here. The optimum decision in a question of reproduction and preservation of zonal types of vegetation in subzone of desert steppes of Crimea is the foundation of Sivashsky national park.

ANTROPOGENOUS TRANSFORMATION OF THE VEGETATION AND DIVERSITY OF SEGETAL COMMUNITIES ON THE CRIMEAN PENINSULA

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Today more than 70% of territory of the Crimea is occupied by arable lands on which are grown up cereal, root-crops cultures, vineyards and orchards. In the past, these areas were covered by steppe, forest-steppe and forest communities of classes *Festuco-Brometea, Festuco-Puccinellietea, Quercetea pubescenti-petraeae* and other. Segetal communities of the Crimea began to be studied at the end of 1980th by Braun-Blanquet method. The first publications on vegetation classification appeared in 1990-1992 (Solomakha, 1990, Solomakha et al., 1992). The vegetation of cereals and root-crop cultures was included in classes *Secalietea, Chenopodietea, Oryzetea sativae*. We studied segetal communities of tobacco, maize, vegetables, sunflower, technical cultures (rose, lavender), vineyards and orchards in 1989-2005 (2680 relevés) (Bagrikova, 1996-1998, 2001-2006). Besides, we worked up more than 730 relevés done by S.K.Kozhevnikova and L.V. Makhaeva in 1971-1975 for cereals, crops cultures and vineyards (unpublished data). Today according to modern representations about classification of synantropic vegetation (Bagrikova, 2004, 2010; Berg et al., 2001; Jarolнmek et al., 1997; Korzhenevsky et al., 2003; Rivas-Martнnez et al., 2002, Solomakha, 2008; Chytry, 2009, etc.) segetal vegetation of the Crimea includes 50 associations, 12 alliances, 7 orders from 3 classes: *Stellarietea mediae, Oryzetea sativae* and *Artemisietea vulgaris*. The community of class *Artemisietea vulgaris* are characterised by the greatest α-diversity (19-21 species/25 m^2). Many species of native flora is a part of these communities. The community of *Atriplici-Chenopodietalia albi* (15 ass.), *Sisymbrietalia* (15 ass.) from class *Stellarietea mediae* are differenced by greatest β-diversity. The greatest syntaxonomy diversity is noted for mountain areas where more than 30 associations are described. It speaks by variety of an environment conditions and agricultural crops. In steppe zone 25 associations are revealed. The Crimea is characterized by quite high percent of new syntaxa, 13 associations (26%) have been described for the first time for Crimean peninsula.

CONSERVATION AND RESTORATION OF XEROTHERMIC GRASSLANDS IN POLAND – THEORY AND PRACTICE

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Calcareous xerothermic grasslands in Poland are seriously threatened from intensified agriculture, afforestation, land abandonment, natural succession and many others processes. As a consequence, many xerothermic species are rare and endangered. The project that started in 2010 addresses the issues of xerothermic grassland conservation and restoration in two localities in Poland: Lower Odra and Warta region (NW Poland) as well as in SE Poland. The project is coordinated by the Naturalists' Club and Regional Directorate for Environmental Protection in Lublin is a partner. 50% of funds for project implementation are provided by the LIFE Nature and Biodiversity Financial Instrument of the European Commission. Several activities planned in the project covers: removing of shrubs and trees from the overgrown grasslands, removing non-native and expansive species, conducting mobile pasturage on selected grasslands, establishing cooperation with local farmers to renew extensive agriculture on the grasslands, purchasing some of the most valuable grasslands, restoring degraded grasslands. Moreover both scientific research and education are conducted as well. We expect that over 200 ha of the most valuable grassland in the two regions will be covered by our activity. The results of the project obtained up to now and activities expected in the future are presented together with discussion on some problematic and unexpected issues.

DOUBLE DIRECTIONAL EFFECT OF A FOREST EDGE ON INVERTEBRATE DIVERSITY OF A DRY GRASSLAND

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Eastern Austrian dry grasslands are confronted with two main threats: grasslands on fertile soil have almost completely been converted to arable land within 20th century, while unproductive grasslands are threatened by abandonment, shrub encroachment and afforestation. Today most dry grasslands are small remnants in an agricultural matrix, typically surrounded by or adjacent to other non-matrix landscape elements such as shrub and groves. Edge effect is thus a characteristic trait of dry grasslands in Eastern Austrian agricultural landscapes which has to be considered in conservation management.
In order to assess the implications and extent of such edge effects on invertebrate communities, we compared species numbers of epigeic invertebrates at a natural steppe site along a more than 200 m long gradient from the borderline of a pine plantation to the undisturbed centre of the grassland. Ants, bugs, carabid and staphylinid beetles, orthoptera, snails and spiders were considered. Since the study site is part of a military training area with entrance restriction, all sampling was done by pitfall trapping.
Overall species number showed a maximum at the edge, as could be expeted. However, there was a second maximum at the centre of the grassland, and thus a minimum at an intermediate distance from the edge. Species numbers at the two maxima were found to be identical. Undisturbed grassland interior thus did provide habitat for as many species as did the grassland-forest-edge. While the diversity gradient from the maximum at the edge to the minimum was rather steep, the increase from the minimum to the maximum at the centre took a much longer distance.
These results are at once in line and at variance with most previous studies concerning edge effects. We conclude that not only dry grassland habitats rich in structural diversity, such as edge habitats, provide for high species numbers. In fact, high quality interior grassland habitat can harbour a comparable species diversity. For the management of dry grassland remnants in agricultural landscapes, the enhancement as well as the reduction of structural diversity seem to be two equally justified conservation targets which should be balanced by clearly designating different remnants to different objectives.

DESTRUCTION OF LAST UKRAINIAN GRASSLANDS THROUGH AFFORESTATION

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Geographically the Steppe (Grassland) Zone covers 40 % of Ukraine but the area of natural steppe fragments covers less than 3 % because of large-scale plowing-up.
However a new thread has arisen. 29.12.08 State Agency of Forest Resources (SAFR) issued the Order No.371 "About the approved indexes of regional standards of optimal forest area in Ukraine". According to the Oder No.371the main areas for probable afforestation are situated on the state reserve lands of the Steppe Zone i.e. on the last fragments of grasslands. Afforestation requires plowing and planting of trees in the steppe. It will exterminate entirely virgin vegetation and change species composition. That is why ecologists have established the public campaign "Save Ukrainian steppes!" for protection of grasslands.
The law-term "steppe" in the Ukrainian legislation is absent in fact. Usually steppes are indicated in documents as degraded and low-yielding agricultural lands. Therefore SAFR declares that it doesn't afforest grasslands, it afforests degraded and low-yielding lands.
The natural Forest Zone of Ukraine has the most suitable climate conditions for growth of forests. However, SAFR doesn't try to restore forests on the large-scale felled areas there. Why? Because felled forests are often indicated as real forests in official documents. Therefore SAFR intends to make afforestation in the Steppe Zone to improve statistics.
Defenders of the steppe are not against enlargement of forest in Ukraine. We stand for correct selection of lands for afforestation. We try to keep modern principle of wildlife protection: "man's non-domination under nature". Therefore we consider the Steppe Zone first at all must consist of steppe landscapes, the Forest Zone must consist of forests. It is so simply.
In the Stepe Zone we admit afforestation of plowed-up territories for making wind-break forest strips against soil erosion. It is also possible afforestation of the lands destroyed by mining industry, and along riversides. However, we are totally against any afforestation of natural steppe territories.
In fact afforestation of steppe fragments violates the requirements of Bern Convention and Convention of Biological Diversity. We appeal all environmental organizations of the world to support our requirements to Ukrainian authorities to forbid immediately the planting of forests on natural steppe areas.

DRY GRASSLANDS OF *Calluno-Ulicetea* Br.-Bl. & R.Tx. ex Klika & Hadač 1944 CLASS OF THE UKRAINIAN CARPATHIANS: SYNTAXONOMY AND BIODIVERSITY

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Ranges of semi-natural and anthropogenous vegetation of *Calluno-Ulicetea* class communities considerably increased due to human activity. They are typical vegetation type for Carpathians forest belt, there they occupy great areas. These communities prefer poor nutrient dry acid soils. They usually use as pastures and infrequently as hayfields.

This research based on regional phytocoenological literature data and field geobotanical descriptions from the Ukrainian Carpathians (Beskydy, Gorgany and Chornohora ridge).

The studied communities are mostly dominating by *Nardus stricta* L. They are classified in two alliances: *Nardo strictae-Agrostion capillaris*, which prefer dry heaths grasslands of mountain and submountain belts and *Violion caninae*, which prefer low-productive dry secondary grasslands and pastures of the uplands and mountaine belt. First of them includes 3 associations, such as *Antennario dioicae-Nardetum strictae*, *Hypochaerido uniflorae-Nardetum strictae*, *Helictotricho planiculmes-Nardetum strictae* and second alliance includes 2 associations, such as *Campanulo rotundifoliae-Dianthetum deltoides*, *Festuco capillatae-Nardetum strictae*.

Abstract presents data from 135 plots (100 m2 each), there 187 plant species are found. Basic ecological parameters (altitude, aspect, inclination, microrelief, land tenure type, plant cover structure) are recorded for each experimental plots.

The communities with domination *Nardus stricta* are characterized by low species composition. There are on the average 38-45 species of vascular plants and on 2-5 species of bryophytes and lichens. Some of the oligotrophic species (*Agrostis capillaris*, *Briza media*, *Campanula rotundifolia*, *Hypericum maculatum*, *Pimpinella saxifraga*, *Polygala vulgaris*, *Potentilla erecta*, *Sieglingia decumbens* etc.) belong to the group of species with high constancy.

Sozological values of these communities are determinated by high species richness and many rare and endangered species presence. There distribute orchids species, for example, *Coeloglossum viride*, *Dactylorhiza majalis*, *D. sambucina*, *Epipactis helleborine*, *Gymnadenia conopsea*, *Listera ovata*, *Platanthera bifolia*, *Spiranthes spirales*.

Main threats for class *Calluno-Ulicetea* communities are changes of land-use forms. Discontinuance of pasture and haying in these areas may result to disappearance of these communities due to wood species occupancy.

ROADSIDES, RAILWAY VERGES AND BORDERLINES IN THE GREAT HUNGARIAN PLAIN – AND THEIR CONSERVATION (SE HUNGARY)

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In the fragmented agricultural landscape of the Great Hungarian Plain the plant species of Pannonian loess steppe, which show the original vegetation often survived only in verges (boundaries, field margins). Verges are few (on average 2-15, max. 50) meters wide lawn strips running along roads, railways, borderlines and ditches. Two main types of the verges can be distinguished in the landscape: The primary verges take a slice of the original vegetation with several protected or endangered plant species of steppe. The secondary verges are abandoned from arable field, valuable species are found on these habitats only rarely. Our study was undertaken in the Csanádi-hát loess region (SE Hungary) (approx. 940 km^2). During the 10-year long investigation in each mapping unit of the Central European Flora Mapping System (approx. 6.5Ч5.5 km) of this area the average number of the protected plant species was 5.5. Among these species 1.0 (18.6%) species was found only in coherent areas (meadow, forest, arable land etc.), 0.4 species (6.6%) occured both in coherent areas and verges and 4.2 species (74.9%!) occured only in verges. In the Csanádi-hát considering the number of habitats and the size of populations 90-100% of the protected plant species *Adonis vernalis*, *Ajuga laxmannii*, *Anchusa barrelieri*, *Clematis integrifolia*, *Inula germanica*, *Oxytropis pilosa*, *Prunus tenella*, *Silene bupleuroides* and the *Vinca herbacea* were found in the verges. Further species *Carduus hamulosus*, *Linaria biebersteinii*, *Ornithogalum brevistylum*, *Phlomis tuberosa*, *Sternbergia colchiciflora* etc. have also significant populations in roadsides and boundaries. At present, the verges are in general not protected. In Csanádi-hát in each mapping unit of the flora mapping system 71,0% of the protected plant species was found in unprotected verges only. These small grassland fragments are supposedly also of great importance in other loess lowland areas (e.g. Central and E Hungary, W Romania, N Serbia). The verges are very endangered because of lack of treatment (mowing, grazing), shrubs, ploughing and pollution. The preservation of the verges needs new nature conservation strategies in the Pannonian Biogeographical Region. Establishment of numerous small nature reserves in the primary verges are necessary and realization of the adequate treatment also.

FACTORS AFFECTING THE DIVERSITY AND STABILITY OF DRY GRASSLAND 1 DEVELOPED IN OLDFIELDS

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There are about 300 000 hectares of old-fields in Hungary on which semi-natural vegetation can develop. At the edge of forest and forest-steppe zone the development of dry grassland is affected by macro- and microhabitat. We studied the effect of spatial position, age of abandonment and shrub encroachment on the grassland species richness and composition.
We studied an about 170 hectare large area in Pilis Mountain (North-Hungary, near Budapest), which was ploughed and gradually abandoned, but partly mowed later. We distinguished the old-fields according the time of abandonment (4 age-groups) and the level of shrub encroachment (3 types). 12-12 2x2m large relevés were made in every combination, altogether 108 relevés.
We used GLMs for the detection of the effect of the studied factors on the dry grassland species richness and on several species groups (dry grassland specialist, forest specialist species).
At fine scales the shrub amount has the most important effect on the richness of dry grassland specialist and forest species and not the time since abandonment. Without establishment of shrubs a species rich grassland can develop and persist for a longer time. Probably the land-use pattern after abandonment has the most important effect on the diversity of the grassland as it determines shrub establishment and development.

CHANGES OF FLORA AND VEGETATION IN THE BROCZóWKA STEPPE RESERVE

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Broczówka reserve located about 1.5 km north-east of Skierbieszyw is a part of Skierbieszowski Landscape Park. It is situated in south-east part of Lublin Upland, in the mesoregion of Dzia&#322 y Grabowieckie. It was established in 1989 for conservation of xerothermic plant associations with rare and protected plant species. The floral research in Broczywka reserve was carried out in 2004-2010. Their results were compared with historical data from 1980s. Numerous species that were noted here 30 years ago were not found in the present study. Many of them (33 from 71) are rare xerothermic species belonging to *Festuco-Bromea* class e.g. *Adonis vernalis, Echium russicum, Linosyris vulgaris, Linum flavum, Rosa gallica, Scorzonera purpurea, Orchis militaris, Gentiana cruciata, Iris aphylla*. The vegetation cover, especially grasslands area and structure have changed since researches conducted in 1980s. The xerothermic grasslands associations have became poorer in species and more homogenous. Both the number of species forming individual communities and index of diversity has decreased. Three of distinguished here plant communities were not identified in the present studies: *Potentillo alba-Quercetum, Ulmetum campestris suberosae, Prunetum fruticosae*. The changes that have place in Broczywka reserve are analogous to that observed in others steppe reserves and generally in xerothermic grasslands.

SCALE-DEPENDENT PATTERNS OF PLANT DIVERSITY IN TRANSYLVANIAN DRY GRASSLANDS (ROMANIA)

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We studied plant diversity pattern in various types of dry grasslands (meso-xeric, xeric, stony) in different regions of the Transylvanian Lowland (Romania). For this purpose, we used both a nested-plot sampling (0.0001 ml, 0.001 ml, 0.01 ml, 0.1 ml, 1 ml, 10 ml, 100 ml n = 20 series) and additional 10-ml plots (n = 75 including the 10-ml plots from the series). In each plot we recorded all vascular plants, bryophytes, and lichens with the any-part (shoot presence) method. Further, we recorded topographic and land use parameters and measured several soil parameters (pH, loss at ignition, carbonate content, texture).
We found that in general the Transylvanian dry grasslands are very species rich at any grain size. For the grain sizes of 0.1 ml and 10 ml we even found world records of vascular plant species richness, with 43 and 98 species, respectively, found in a certain nature reserve near Cluj-Napoca. With single and multiple regressions as well as ANOVAs, we analysed which factors influence richness at the 10-ml scale. The mesoxeric, mown grasslands were generally the richest. Among all tested continuous variables, heat index was the most important predictor of species richness, with a negative influence. Finally, we analysed the function types and function parameters of species-area relationships (SARs). We compare these between vegetation types and taxa within Transylvania and towards dry grasslands in other parts of Europe.

FLORA AND CULTIVATION RELICTS OF "BŁONIE" AND "CHLEBNIA" EARTHWORKS

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Relics of cultivation are synanthropic plants grown for a certain period in the history of agriculture, whose localities despite the abandonment of their crop are still existing now in the vicinity of their former use. The examples of ancient relics in Poland are *Allium scorodoprasum*, *Malva alcea*, *Lavatera thuringiaca*, *Leonurus cardiaca* and *Lithospermum officinale*. Probably many steppe plants, included among species of the class Festuco-Brometea such as mentioned *Lavatera thuringiaca*, can have such an origin in Poland. The places particularly abundant in these species and relics of cultivation are good repair archaeological sites such as earthworks - remains of old castels and settlements, which nowadays usually have form of a small hill or shaft-shaped ring surrounded by a moat. Maintaining of localities of aforementioned species on these places to the present (even by a few hundred years) was made possible by slowing or stopping the natural succession, e.g. by grazing.

On two earthworks "Błonie" and "Chlebnia" (both in the Mazovia Voivodeship) and in their immediate vicinity was made a complete inventory of vascular plants. On each object some potential microhabitats were distinguished and data on the abundance of individual species within them were collected. Floras of earthworks were compared with each other, with the vicinities and with eartworks and barrows in other regions. Totally, 230 taxa of vascular plants were found: on the "Chlebnia" earthwork 145 species, while on the "Błonie" 163 species. At both sites synanthropisation ratios were high (more than 70%), while the largest group of historical-geographical classification (Kornaś 1981) were apophytes (60%). Among the Raunkiaer's life-forms in both places predominated hemicryptophytes (60%). Variations in habitat conditions in different parts of earthworks (from the marshy moat to desiccated peak of the shaft) reflected in high species richness of plants in a relatively small areas.

Two species - relics of the old crop: *Malva alcea* (on both earthworks) and *Lavatera thuringiaca* (only on the "Błonie" earthwork) were found. Besides the latter species were found also other species associated with xerotermic grasslands in Poland, such as *Ajuga genevensis*, *Carex caryophyllea*, *Centaurea stoebe*, *C. scabiosa, Filipendula vulgaris*, *Phleum phleoides* etc. Studies confirmed the role of earthworks and, indirectly, other archaeological sites in preserving biodiversity in the agricultural landscape.

STRUCTURE OF SOME SPECIES CENOPOPULATIONS IN THE MEADOW-STEPPE COMMUNITIES OF NATIONAL DENDROLOGICAL PARK "SOFIYVKA" AND THEIR CHANGES UNDER ANTHROPOGENIC PRESSURE

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Study of the coenopopulations structure as integral systems actually considered as an important problems because stability of the existence, stable productivity and dynamic of meadow-steppe communities under different anthropogenic loading in the most cases are determined by population's structure of the species which are composed communities.
The aim of present work is studying of structure and functioning of population of the *Phlomis tuberosa* L., *Salvia pratensis* L. and *Trifolium montanum* L. in meadow-steppe communities of the National Dendrological Park (NDP) "Sofiyvka" of the NAS of Ukraine.
With purpose of revealing the features of reproductive and growth processes of the individuals in populations and estimating of their vitality the morphogenesis of the model species was investigated using statistic methods of morphometric parameters (Zlobin, 1980, 1981, 1989). As morphometric parameters use 9 main indications which characterize growth, form-build and reproduction.
For comparison of the morphogenesis and vitality structure of indicator species in NDP "Sofiyvka" (plot "Gribok") with other conditions and different level of fenisicial (hay-mowing) gradient were additionally investigated *Salvia pratensis* populations on steppe slopes in Hayvoron town (Kirovohrad reg.) and Pikivets village (Cherkasy reg.), *Trifolium montanum* populations in meadow communities Makovytsia mount. near Yaremche town (Ivano-Frankivsk reg.) and Pikivets vil. (Cherkasy reg.), *Phlomis tuberosa* populations on steppe slopes near Pikivets vil. and Buky vil. (Cherkasy reg.).
Estimation of the present state and perspectives of cenopopulations of the model species at the territory of NDP "Sofiyvka" allowed to make following conclusions: the 9 parameters of the partial shrub were studied, the most significant are three parameters — total phytomass of the plant, high of plant and number of inflorescences; for all studied indicator species on the control plots observed spectrums of prosperity types with high index of population's quality as an evidence of the good fitness of species to the existence in meadow-steppe cenoses which not undergo intensive man-made activity; under pass through from control plots to the plots of second stage in fenisicial gradient the populations turned out to balanced with significant decrease of the quality index; all studied populations actually are in the state of dynamic balance.

COMMUNITIES OF THE *Helianthemo-Thymetea* Romaschenko, Didukh, Solomakha 1996 CLASS IN UKRAINE

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Plant communities on carbonate substrates in xerophytic conditions are quite specific. We refer them to cl. *Helianthemo-Thymetea* Romaschenko, Didukh, Solomakha 1996. They differ from steppe communities of cl. *Festuco-Brometea* Br.-B1. & R. Tx. 1943, which have high degree of coverage, composed by gramineous hemicryptophyte plants and form deep layer of humus. Communities of cl. *Helianthemo-Thymetea* have low degree of coverage (5-60%), composed by evergreen chamephytes with obligated dormant period, on eroded soils, when upper surface of the roots and caudex are not covered by substrate. Thus, geochemical processes differ from such of steppic communities and cl. *Helianthemo-Thymetea* cannot be included in cl. *Festuco-Brometea*. The floristic peculiarity of this class is presence of *Lamiaceae* plant species, frequently endemic. It resembles mediterranean tomillares. Syntaxonomically it stands near cl. *Cisto-Micrometea* Oberd.1954, although differ by species composition and composed by similar nonmediterranean species. On the other side, it is close to ord. *Alysso-Sedetalia* Moraves 1967 Moraves 1967, although dominated species are *Artemisia, Jurinea, Hyssopus, Scrophularia, Thymus, Pimpinella, Matthiola* etc.
Communities of this class belong to ord. *Thymo cretacei-Hyssopetalia* Didukh 1989, two classes and several associations.
The most typical is all. *Artemisio hololeucae-Hyssopion cretacei* Romaschenko, Didukh, Solomakha 1996, distributed in Ukraine and Russia in Siversky Donets, Don and Volga basins on steep slopes, calcareous substrates and poor dry skeleton soils with pH 7,5-8,1. It includes ass. *Artemisio hololeucae-Polygaletum cretacei* Didukh 1989, *Artemisio nutantis-Plantaginetum salsae* Didukh 1989, *Scrophulario cretacei-Helianthemetum cretacei* Romaschenko, Didukh et V.Sl. 1996, *Onosmo tanaiticae-Andosace tumkoso-poljanskyi* Romaschenko, Didukh et V.Sl. 1996. Communities of all. *Euphorbio cretophilae-Thymion cretacei* Didukh 1989 occupy low sloped hills with slight erosion, they have higher degree of coverage (20-60%), include ass. *Jurineo brachycephalae-Helianthemeto cretophilae* Romaschenko, Didukh et V.Sl. 1996, *Euphorbio cretophilae-Jurinetum brachicephalae* Didukh 1989.

Floristic richness and rare plant species of the National Nature Park "Buzky Gard"

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The flora has a considerable diversity of species and includes over 1000 species of plants. 34 species of vascular plants are listed in the Red Data Book of Ukraine (2009). There are such species as *Stipa capillata, Stipa lessingiana, Stipa grafiana, Moehringia hypanica, Iris pontica, Pulsatilla nigricans, Crocus reticulatus, Stachys angustifolia, Tulipa quercetorum, Tulipa hypanica, Ornithogalum boucheanum, Fritillaria ruthenica, Thalictrum foetidum, Onosma graniticola, Adonis vernalsi, Astragalus dasyanthus, Dianthus hypanicus, Cerasus klokovii* and other. Six species – into the 1991 European Red List of Globally Threatened Animals and Plants. In addition to the steppe, meadow, forest, and cliff breeds, many sub-Bug and sub-Black Sea endemics are found here as well as relicts of various geological eras: *Dianthus hypanicus, Moehringia hypanica, Silene hypanica, Sedum borissovae* and other.
However plant species from the Red Book do not scoop out a list of oll species in need of protection. Many typical plant species are in composition of plant associations such as: *Festuca valesiaca, Elytrigia repens, Koeleria cristata, Spiraea crenata, Caragana frutex, Cotoneaster melanocarpus, Galium verum, Salvia nutans, Fragaria viridis, Astragalus albidus, Filipendula vulgaris, helichrisum arenarium, Thymus dimorphus, Iris pumila, Potentila arenaria.*
Preservation of biological diversity on the territory of the national park is a priority issue.

SYNTAXONOMY OF CLASS *Festuco-Puccinellietea* IN UKRAINE

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Class *Festuco-Puccinellietea* Soy ex Vicherek 1973 includes fresh and dry meadow intracontinental communities on solonetz soils. In Ukraine it counts two orders: *Artemisio santonicae-Limonietalia gmelinii* Golub et V. Solomakha 1988 with five alliances: *Artemision santonicae* Shelyag-Sosonko et V. Solomakha 1987 (6 associations), *Astero tripolii-Puccinellion distantis* V. Golub et V. Solomakha 1988 (6), *Puccinellion fominii* Shelyag-Sosonko et V. Solomakha 1987 (5), *Puccinellion giganteae* V. Golub et V. Solomakha in Dubyna et Neuhдuslová 2000 (10) *Salicornio-Puccinellion* Mirkin in V. Golub et V. Solomakha 1988 (2), and *Puccinellietalia* Soy 1947 with three unions: *Festucion pseudovinae* Soy 1933 (4 associations), *Camphorosmo-Agropyrion desertorum* Korzhenevskij et Kljukin in Golub et al. 2005 (2), *Atraphaxio-Capparion* Korzhenevskij et Kljukin 1988 (1).
The leading factors of coenotical diversity and their differentiation are ecotopical relief habitat, flooding duration, soil type and its density, degree of salinity. The class is characterized by the richness and high compared coenodiversity with foreign communities. It is conditionally to the diversity of habitat conditions, particularly in southern Ukraine, where salted soils are widespread.
A coenotaxonomical specificity group is revealed on the levels of associations and unions. In particular, alliances *Artemision santonicae*, *Puccinellion fominii*, *Atraphaxio-Capparion*, *Salicornio-Puccinellion* and relevant associations are unique in Ukraine. Features of coenotical structure in class *Festuco-Puccinellietea* communities are very high density of herbage (60-80 (100%)) and average species richness (10-15 species). There are two layers often in the herbage. These communities are usually located between *Juncetea maritimi* and *Scorzonero-Juncetea gerardii* ones in the successional series.

VEGETATION DATABASE OF DRY GRASSLANDS FROM THE TRANSYLVANIAN BASIN, ROMANIA

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Despite the increasing effort of many countries to collect, digitize and analyze vegetation data, Romania has a considerable delay in this respect. To fill this gap at least partially, we initiated a program for compiling a vegetation-plot database, which aims at collecting all available phytosociological relevés of dry grasslands and related communities from the Transylvanian Basin, Romania. Presently, more than 1200 digitized relevés of an estimated total of 4000 are available in our database. Communities that are best represented belong to the Class *Festuco-Brometea* (69%), *Seslerietea albicantis* (16%) and *Festucetea vaginatae* (4%), which reflect the frequency of occurrence (distribution) of these grassland types in the studied region fairly well. The database relies mostly on published vegetation surveys (>90% of the relevés) and give an overview about the history of vegetation research in Transylvania: the oldest relevés were recorded in 1936, more than 60% of the relevés were made between 1940–1980, while only 15% after 2000 (a major bias compared to other databases, e.g. Czech National Phytosociological Database, Chytrə & Rafajová, 2003, *Preslia*). The nomenclature of species listed in relevés is following Flora Europaea (Tutin et al., 1964–1980), facilitating possible future use in combination with other European databases. The plot sizes of all the relevés fall between 1–200 m^2, and the majority (>85%) of vegetation data included important environmental background data (altitude, slope aspect, inclination). The re-localization of the geographic position of the relevés (by finding coordinates) could be done only approximately, based on the vague descriptions and local geographical names given in the primary sources.
The database can be used for answering a large spectrum of phytosociological (e.g. classification) or ecological questions about dry grasslands from the Transylvanian Basin. One of our first goals was to detect variation in floristic composition as a result of different land-use practices (extracted also from the primary sources - published papers), since data about the effect of different management types on these grasslands of high nature conservation value is urgently needed for conservation purposes.

DRY GRASSLAND COMMUNITIES OF GREEN BELT OF KYIV

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The distinctive feature of boreal forest communities of Kyiv is the presence of meadow-steppe grass species (*Iris hungarica, Cerasus fruticosa, Trifolium montanum, Veronica incana, Salvia pratensis* etc) unlike the forests of Polissia region. In return, steppe communities have feeble floristic composition comparing to western, eastern and southern steppes. The typical calcareous species are absent here, but many sandy species appear (*Helichrysum arenarium, Sedum acre, Hieracium pilosella* etc). This distinctive feature of pine forests and meadow steppes we call an "ecological transversion".
On sandy dunes on the north of green belt of Kyiv the fragments of *Corynephorion canescentis* Klika 1934 communities occur. On the old alluvial sand deposits the perennial open siliceous grasslands of alliance *Koelerion glaucae* Volk 1931 occur. The more developed communities of alliance *Festucion beckeri* Vicherek 1972 (*Festucetea vaginatae* Soo 1968 em Vicherek 1972) are also found.
Steppic meadows occupy mainly upper places of valley of Dniper River – top and middle parts of high ranges and also raised well drained plots, which belong to *Agrostion vinealis* Sipaylova, Mirk., Shelyag et V. Sl. 1985 alliance (*Molinio-Arrhenatheretea* R.Tx. 1937). Floristic composition of these communities vary, the dominants are *Poa angustifolia*, *Agrostis vinealis*, *Galium verum*.
Steppic vegetation includes communities of *Festucion valesiacae* Kolbek in Moravec et al. 1983 as well as *Fragario viridis-Trifolion montani* Korotchenko, Didukh, 1997 (*Festuco-Brometea* Br.-Bl. et R.Tx. in Br.-Bl. 1949). The communities of psammophyitic steppes, which occur on the second pine-forest terrace, include many sandy species such as *Helichrysum arenarium, Chondrilla juncea, C. graminea, Trifolium arvense, Polygonum arenarium* as well as endemic *Thymus pallasianus*, *Tragopogon ucrainicus*, *Thymus tschernjajevii*.
Edging dry grasslands around the agricultural fields are presented by *Artemisietea vulgaris* Lohmeyer et al. ex von Rochow 1951 communities (*Convolvulo-Agropyrion repentis* Gors 1966) and *Trifolio-Geranietea* Th. Mull. 1961 (*Geranion sanguinei* R.Tx. in Th. Mьller 1962), that occur on the forest edges and disturbed places with pretty dense loess or sandy soils.
Therefore, despite the considerable anthropogenic pressure of large urban and industrial Kyiv center, which cause the changes in vegetation cover, the dry grassland vegetation communities is pretty diverse mainly due to valley of Dniper River.

HABITATS OF ENDEMIC AND RARE PLANT TAXA OF PRESPA NATIONAL PARK, NORTHWESTERN GREECE

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The floristic catalogue of Prespa National Park (northwestern Greece) includes more than 1500 plant taxa, many of which are endemic and/or rare. Conservation of the populations of these taxa requires survey and protection of their habitats. The present paper aims at presenting the habitats of endemic and/or rare plant taxa in Prespa National Park through a survey carried out in 2009 and 2010. Taxa of particular interest are *Phelypaea boissieri* (Reuter) Stapf (a rare species and a Balkan endemic), which appears in a plant community classified in Festuco-Brometea, and *Erodium guicciardii* Boiss. (Balkan endemic), which grows in plant communities of the *Festuco-Brometea* and *Daphno-Festucetea* classes. Several endemic taxa, primarily of the *Saxifraga* and *Silene* genera, are found mainly on rocky slopes (class *Asplenietea trichomanis*). The communities of *Juncetea trifidi* (where *Nardus stricta* L. is the dominant species) also host a number of important taxa including *Crocus pelistericus* Pullvic (rare species, mid-west Balkan endemic) and *Viola orphanidis* Boiss. (mid-west Balkan endemic).

OVERCOMING SEED LIMITATION IN DEGRADED INLAND SAND ECOSYSTEMS BY EPIZOOCHOROUS DISPERSAL: A SIX-YEAR RESTORATION PROJECT

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To test the contribution of roaming sheep flocks to the colonisation of seed-limited restoration sites by means of epizoochorous seed dispersal, a field experiment was carried out (2005-2010) on three newly established nutrient-poor deep-sand plots.
At the beginning of the experiment, seeds of 14 species typical for FFH-inland sand vegetation were experimentally attached to the fur of sheep. For most of these species, natural epizoochorous dispersal had been documented (Wessels et al. 2008). The sheep were present for 24 hours on the plots (Wessels-de-Wit & Schwabe 2010). Yearly sheep grazing as management was implemented.
Within the investigation period 13 target species (e. g. the threatened species *Koeleria glauca, Stipa capillata, Alyssum montanum* subsp*. gmelinii*) became established. In the course of succession, however, ruderal species were introduced by aerial seed rain. Seed trap investigations showed high proportions of *Conyza canadensis* and *Sisymbrium altissimum*. Ruderalization processes could be diminished by grazing. In 2009, target species ratios (target species number/total species number) were about 0.4 (target area: ca. 0.6). DCA ordination showed that the plots developed in the direction of target areas.
The experiment proves a contribution of sheep epizoochory to the restoration of endangered sand grassland by connecting target areas and isolated restoration sites.

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HYPOTHESIS OF MANAGEMENT IN SECONDARY DRY-GRASSLANDS IN MOLISE (CENTRAL ITALY)

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"Collemeluccio-Montedimezzo" Man and Biosphere Reserve, located in the Molise Region (Central Italy) is currently constituted by two forestry cores. Since Biosphere reserves are physically organized into 3 inter-related zones (core buffer and transition areas) belonging to Seville Strategy (1995) and Madrid Action Plan (2008), an ongoing project will increase the protected area from the actual 637 to 25,000 Ha.
The study area includes 7 countries joined in a consortium, named ASSO MAB.
It is characterized by high landscape diversity and by habitat preserved. In fact the 86% of the area is covered by natural vegetation, distinguished in 66% of forests, 7% of shrub vegetation and 12% of grasslands. The high naturalistic value of this area is testified by the presence of 7 SCI, which are characterized by a total of 12 habitats belonging to Habitat Directive 92/43/EEC.
The aim of this study is to identify the main types of grasslands. We focused on 6210 (*) semi-natural dry grasslands and shrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites), because in the study area they represent one of the habitats most threatened by the forest colonization.
We performed multivariate analysis on 50 phytosociological relevés performed in 2010 (Podani, 2000, ter Braak C. J. F. & Љmilauer P. 2002). The high diversity was resulted particularly related to environmental variables, such as altitude and soil moisture. Human activities also played an important role in species composition.
In order to identify the priority areas more subjected to the forest expansion, we analyzed the vegetation contacts between these grasslands and the other vegetation types, using a platform GIS (ArcGis 9.3).

DRY GRASSLAND VEGETATION OF LANDSCAPES INTENSIVELY USED FOR AGRICULTURE: THE ZEMGALE LOWLAND, LATVIA

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Semi-natural grassland species diversity has decreased in the second half of 20th century due to the intensification of agricultural and abandonment of traditional management practices. The study area, the Zemgale Lowland is situated in the Central part of Latvia and is characterized as region the most intensively used for agriculture – agricultural land occupies 50-80% of the total area. Situation about the distribution of dry grassland species is not clear for the territory. The aim of the study is to find out the distribution patterns of dry grassland species in the Lowland and to identify factors affecting the distribution of the species.

Field survey data about dry grassland species distribution in the river valleys of the Lowland and the data from the grassland database of the Latvian Fund for Nature, as well as data from herbarium of the Institute of Biology of the University of Latvia were used for the research. Information about 28 environmental factors was collected during the research.

Results show that more species were found in the western and eastern parts, but less in the central part of the Lowland. Localities of species were concentrated in the valleys of rivers with few exceptions. High proportion of localities is connected to the river valleys, where soil parent rock consists of sand and gravel. Deeper valleys with steeper slopes contained more species than shallow ones.

Three plant communities were identified. Species composition of *Filipendulo vulgaris-Helictotrichetum pratensis typicum (Festuco-Brometea)* community is more similar to the class communities described in the Central Europe, but subassociation *caricetosum flaccae* (*Festuco-Brometea*) is a local syntaxonomic unit. *Trifolio medii – Agrimonietum* (*Trifolio-Geranietea*) community is characterized by presence of ruderal species.

The area of described localities is very small - only 3% of them exceed 1 ha. Dry grassland species richness correlates with increasing of light and decreasing of nutrient amount in soil as well as with soil moisture, reaction and continentality of microclimate. Higher diversity of xerothermic vegetation observed in localities distant from arable land. *Thymus ovatus, Polygala comosa, Poa compressa, Plantago media, Carex caryophyllea* avoid places closer than 2 m to arable land. Occurrence of ruderal species and weeds increased with increasing proximity to arable land.

ON THE INFLUENCE OF DENSITY AND SPATIAL DISTRIBUTION OF AN ATTRACTIVE SPECIES ON THE PLANT POLLINATOR INTERACTION STRUCTURE IN GRASSLANDS

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A majority of plant species in species rich grasslands are dependent on insects for their pollination. The major pollinator functional groups are known to be polylectic. As such, the reproductive success of grasslands species might be influenced, not only by the species' own traits but also by the presence and hence identity of its neighbors. We constructed a field experiment aiming at investigating the role of the density and spatial distribution of *Centaurea cyanus* on the plant pollinator interaction structure in two grasslands of the Swabian Alb (Germany). Here, we present results based on a network based approach, and discuss the different implications of the presence, density and spatial distribution of the attractive species on the structure of pollination webs. Additionally to results concerning the entire web, influences at the species level (plant species as well as pollinator functional groups) will be discussed.

SECONDARY SUCCESSION IN SEMINATURAL DRY GRASSLANDS IN HUNGARY

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Regeneration of 35-40 years old abandoned vineyards were studied in West-Cserhát, Hungary. Here we report the results of a 10-year experiment designed to study the behavior of sward matrix species ie: *Festuca rupicola, Dorycnium herbaceum, Calamagrostis epigejos* in mid-successional grasslands in Hungary. The experimental design consisted of 8 permanent plots in west facing slopes, and 8 plots in north facing slopes. Vegetation was sampled in 2x2 m quadrates in each year between 2001-2010. The effects of spontaneous succession were tested using repeated–measure ANOVA and Tukey HSD for post-hoc tests. On the west slopes *C. epigejos* was initially the dominant species, which was present in 73% of relative cover, but decreased toward 51% until 2010. Althought *C. epigejos* declined spontaneously, it remained the dominant species in this exposition. On the north slopes the *C*. *epigejos* was replaced by *Festuca rupicola* in 2007, and by *Dorycnium herbaceum* in 2009. *Andropogon ischaemum* appeared in 2004, and remained subordinated. The most frequent species was *Agrimonia eupatoria*. During the study period, the number of species, the total cover of all species, and the relative cover of subordinated species increased in both investigation areas.

INVENTORY OF STEPPE VEGETATION OF THE OUTER RIDGES OF CRIMEAN FOOTHILLS

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Crimean Foothills is a unique ecotone between mountain and plain zones of Crimea. The vegetation has the forest-steppe zonal type here. Meanwhile, Crimean foothill is historically one of the most sparsely populated and transformed territory.
Last serious vegetation data was published more than 25 years ago. Whereas the land using structure has been considerably altered within this century quarter.
The issue of natural vegetation conservation and its restoration for this area has a great conservation value (creation of biodiversity and biological resources reserves), value of planning (the establishment of ecological networks and frameworks of territories, general development schemes), environmental value (performance of ecosystem services of vegetation).
The main objective of the research is to assess the current state of steppe vegetation in the outer ridges of the foothills of the Crimea.
The total investigated area of the outer ridges approximately is 160,000 ha. The total area of the investigated area occupied by steppe vegetation (excluding other types of natural groups) is 10,943 ha. The distribution of the steppe vegetation for the administrative districts of the is as follows: Belogorskiy region (eastern part of the Foothills) – 9676,5 ha, Simferopolskiy (central part) - 1100 ha, Bakhchisarayskiy (western part) – 166,8 ha. Another eastern region - Kirovskiy has not large amounts of steppe vegetation. Total steppe vegetation is less than 7% of the studied territory.
This uneven distribution of steppe vegetation caused by degree and character of anthropogenic disturbance, areas of administrative districts and zonal features (large areas of forest and shrub vegetation in the Bakhchisarayskiy region).
Among them, 24 species are rare and are included in conservation lists: 18 are in the Red Data Book of Ukraine (2009), 6 – are in IUCN Red List (1998), 5 – are in the European Red List (1991), 10 are the Crimean endemic species.
It is established that all kinds of steppe vegetation is represented by four formations: *Stipeta capillatae, Stipeta lessingianae, Festuceta rupicolae, Festuceta valesiacae*. Syntaxonomical variety of them represented by 26 associations.
Ecological-floristic classification for the Simferopolskiy region performed the existence of vegetation groups which refer to 5 associations, 2 unions, 2 orders of *Festuco-Brometea* Br.-Bl. et R.Tx class.

SPECIES RICHNESS AND BETWEEN-HABITAT DIVERSITY OF DRY GRASSLANDS IN SLOVAKIA

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Diversity patterns in semi-natural grasslands were studied on a large set of phytosociological relevés in relation to several environmental factors in order to answer the following questions:
a) Do dry grasslands belong to species richest communities if compared with other types of semi-natural grasslands?
b) What are the main environmental factors affecting species richness and between-habitat diversity (beta-diversity) in dry grasslands?
c) What is the effect of local species pools on dry grassland diversity?
d) What is the relation between species richness and beta-diversity in dry grassland communities?
A stratified data set of 5423 phytosociological relevés (including only plot sizes from 15 to 25 m^2) was used for analyses. The effects of the following environmental factors were studied: altitude, temperature, moisture, nutrients, soil reaction, latitude, longitude and geological bedrock. The effects of land-use and proportion of high nature value grasslands in the relevé's surroundings were studied as well.
The highest species richness was indicated in semi-dry grasslands on base-rich soils with low nutrient supply. Beta-diversity increased along both temperature and soil reaction gradients and was higher at lower altitudes than in the mountains. Habitats at intermediate moisture and nutrients levels had the lowest beta-diversity. The patterns of beta-diversity were region-specific. Beta-diversity seemed to be inversely related to species richness. The maximum values of species richness were indicated for individual regions and syntaxa.
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EARLY VEGETATION DEVELOPMENT ON GRASS MIXTURES SOWN FORMER SUNFLOWER AND CEREAL FIELDS

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Early vegetation dynamics of former croplands (sunflower and cereal fields) sown with a low-diversity seed mixture (composed of 2 native grass species) were studied in the Hortobágy National Park, East-Hungary. Percentage cover of vascular plants was recorded in four permanent plots per field on seven restored fields between 2006 and 2009. Aboveground biomass samples (ten per field) were collected in June in each year. Weedy species were characteristic in the first year after sowing. In the second and third year cover and species richness was decreased. From the second year onwards the cover of perennial grasses increased. Spontaneous immigration of characteristic unsown grasslands species was also detected, but their cover was low. Short-lived weeds were suppressed, their cover and biomass significantly decreased during the study. Conversely, the amount of litter and sown grass biomass were increased significantly. However, perennial weed cover, especially for *Cirsium arvense* was increased during the study period. Our results suggest that grassland vegetation can be recovered by sowing low diversity mixtures followed up by yearly mowing. Suppression of perennial weed cover requires frequent mowing (multiple times a year) or intensive grazing.

RESTORATION OF AN ACTIVE INLAND DRIFT SAND LANDSCAPE: A CASE STUDY FROM THE CENTRAL NETHERLANDS

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Remnants of active drift sands, part of the European Sand Belt, which stretches from Great Britain to the Ural Mountains, are found mainly in the Netherlands (2% left from the 800 km2 of the 19th century). These sands in the central Netherlands (Veluwe region) are famous for their biodiversity, both in flora, as well in fauna. They are designated as being a Natura 2000 habitat (type 2330: Inland dunes with open *Corynephorus* and *Agrostis* grasslands).
The ecosystem of open sand is very dry with only a limited number of species adapted to the harsh conditions. Among these the grass *Corynephorus canescens*, the xeromorphic moss *Polytrichum piliferum* and many terrestrial lichens, mainly *Cladonia* spp. Natural succession in more sheltered locations in the transition to dry heath or near the borders of planted forest included a large number of Red listed lichen species and fungi.
However, without active blowing sand progressing vegetation succession is a threat to the ecosystem. *Calluna vulgaris* and self-sown *Pinus sylvestris* are forerunners, leading to forest. Moreover, at present this natural succession is speeded up by algal growth, followed by moss and grass encroachment, due to the high atmospheric nitrogen (NH4) input from nearby agricultural activities. Especially the invasive alien moss *Campylopus introflexus* is favoured in the early pioneer stages, outgrowing the lichen flora.
We present our project of large-scale management in the drift sand area of nature reserve `De Haere` (Veluwe North), which is part of a succession of aeolian cells activated in the Middle Ages. Our recommendations are based on inventories of landscape forms and their historical development. The measures were carried out in December 2010 and included cutting of 10 ha of forest to promote the effect of the wind force on the central open area. Moreover 5 ha of topsoil were removed to enlarge the open area which is the source of the blowing sand. Small-scale restoration measures, such as cutting down self-sown trees in the lichen steppes were supervised in order to minimize unnecessary damage to valuable species.

Jungerius, P.D. & Riksen, M. J. P. M. 2010. Contribution of laser altimetry to the geomorphology of the Late Holocene inland drift sands of the European Sand Belt. BALTICA 23(1): 59-70.
Ketner-Oostra. R. & Kruit, L. 2010.Recommendations on the valuable lichen vegetation of the drift sand area of De Haere. Geldersch Landschap, report.

MEADOW-STEPPE VEGETATION OF THE ALLIANCE *Fragario viridis-Trifolion montani* Korotchenko & Didukh 1997 IN UKRAINE

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For the territory of Ukraine steppe is the zonal type of vegetation. They are formed largely on different types of black soil (chornozem) and are represented by the communities belonging to the class *Festuco-Brometea* Br.-Bl. et Tuxen ex Soo 1947. At present due to intensive anthropogenic transformation the steppe area has decreased from 40% to 2% In the meadow steppe ecotopes the large fraction of perennial xeromesophilic and eumesophilic species, mainly herbaceous plants and rootstock grasses, is constantly admixing to the edificators – mesoxerophilic and euxerophilic grasses. Typical meadow steppes of Ukraine with well-formed grass basis and grass canopy are represented by the plant communities of the alliance *Fragario viridis-Trifolion montani* Korotchenko, Didukh, 1997. They grow on slopes of varying steepness and exposure on typical or leached chernozem soils, where limestone and gypsum lie close to the surface. These represent the typical meadow-steppe vegetation of the Forest-Steppe zone of Ukraine, occurring rarely in the western part of the Forest-Steppe zone and sporadically in the north of the Steppe zone. It is established that in the territory of Ukraine the alliance is represented by 7 associations. The association *Thymo marschalliani-Caricetum praecocis* Korotchenko, Didukh, 1997 is the most mesophytic. They are floristically rich, involving a large number of mesophytic forbs species from the classes *Trifolio-Geranietea sanquinei* Th. Muller 1962 and *Molinio-Arrhenatheretea* R. Tx. 1937, capable to resist moderate pasture pressure without significant shift in their floristic composition. The most common well formed communities of the meadow steppes belong to the association *Salvio pratensis-Poetum angustifoliae* Korotchenko, Didukh 1997. The characteristic of these phytocoenoses is the great variety of forbs. Rootstock grasses play a lesser role than the edificator *Poa angustifolia* L. The association *Stipetum pennatae* R. Jovanovic 1956 represents typical indigenous feather-grass communities. These communities occur sporadically in the southern part of the Forest-Steppe zone, and are rare on the boundary with the Steppe zone, mainly in the ravine systems. Shrub meadow-steppes belong to the association *Veronico austriacae-Chamaecytisetum austriaci* Korotchenko, Didukh 1997 which extends rapidly, occupying new areas of protected meadow steppe vegetation that were previously exposed to periodic mowing.

GRASSLANDS OF COASTAL SALINAS FOR BIRDS, FOR NATURE, FOR PEOPLE

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Coastal salinas in the Mediterranean region have always been considered as a very adjusted and profitable human activity. Apart from being useful for the local community, salinas are attractive for nature, as well. Actually, the main coastal saline of Greece (Mesi- Rodopi, N. Kessani- Xanthi, M. Emvolo- Thessaloniki, Kitros- Pieria, Kalloni- Lesvos, Aspri- Messolongi) are remained a non- residential coastal zone and have been designated as protected areas under NATURA 2000 for their ecological value. Hellenic Ornithological Society (H.O.S.) monitors all the Greek Important Bird Areas (IBA) for more than 25 years now. Salinas has a special weight in the IBA network since they host a lot of birds (both in species and numbers) all through the year. Salina of Megalo Emvolo in Angelohori, Thessaloniki (NC Greece) is an excellent case study. Although a small salina and between Ramsar wetlands, it still concentrates a great variety of wild fauna and flora. So far, 203 bird species have been recorded and almost half of them are included in Wild Birds Directive (Directive 2009/147/EC). M. Emvolo proved to have a significant role in bird's migration, especially the autumn's migration, while important bird species (such as Pied Avocet, Collared Pratincole and Little Tern) are recorded there in the breeding season. Apart from the salina's grasslands, wild life is also present in a narrow buffer zone, but in different conditions over the years as a result of the different human pressure for recreation. This is very obvious in the vegetation and habitats of the area since most of the plant species are annuals. 2010's field work presented a quite shifted vegetation map compared to the one of 2000. H.O.S. proposed to the local community a plan of small but important interventions compatible with salina's operation, so the wild nature could be better protected.

SYNANTHROPIZATION OF DRY GRASSLAND IN KYIV

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Kyiv is the capital and the biggest city of Ukraine. Its population is 2,7 million people. In spite of strong anthropogenic pressure there are tailings of natural Dry Grassland. Whole urbanoflora of Kyiv contain 1615 species of plant. The meadow steppes presented by 162 species (10,03%), sandy grasslands – 113 species (7,00%), meadows -182 species (11,27%), synanthropic habitats – 828 species (51,27%).

Natural Dry Grassland is strongly broken. We used the indexes for comparisons of degree of synatropization: Is (sinatropization index)=S/FЧ100%, IAp (apophytization index)=Ap/(Sp+An) Ч100%, IM (modernization index)=Ken/An Ч100%, where S - number of synanthropic species, F - whole number of species, Ap - number of apophytes, Sp – number of spontaneophytes, An – number of anthropophytes, Ken – number of kenophytes.

The highest Is appeared in meadows – 50,54; sandy grasslands – 46,90 and meadow steppes – 45,68. The same conformity to law is looked over in IAp: meadows – 42,86. But second place occupies meadow steppes – 39,51, while sandy grasslands – 33,63. All becomes clear when we will look in IM: sandy grasslands – 80; meadow steppes – 60 and meadows only 57, 14.

That is means meadows at violation filled up natural apophytes but not alien species. Quite another situation is with sandy grasslands. A lot of alien species spreads on transport networks, railway embankment in particular. Therefore sandy habitats with a low degree reserve and cenosis barrier is comfortable habitats same invasive species as *Ambrosia artemisiifolia* L., *Acroptilon repens* (L.) DC., *Cenchrus longispinus* (Hack.) Fernald, *Sorgum halepense* (L.) Pers. and other.

DRY GRASSLAND OF THE FOREST AND FOREST-STEPPE ZONES OF UKRAINE: WHERE ARE THE BORDERS OF CLASSES?

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In accordance of actual Ukrainian phytosociological conception dry grasslands of the Forest and Forest-Steppe zones of Ukraine are belong to the several classes of vegetation: *Koelerio-Corynephoretea*, *Festuco-Brometea*, and *Molinio Arrhenatheretea* (*Galietealia veri* order). The borders between the classes are not clear, some syntaxa, especially transitional have uncertain status. The aim of the present study was determination of the border between these classes on the base of numerical classification, Ellenberg indicator values and Sociological Species Groups. The Modified TWINSPAN algorithm was used for numerical classification of the dataset of herbaceous vegetation (2998 relevés). The 8 clusters which represented dry grassland communities were separated. It were identified on the base of diagnostic species (phi-coefficient more than 0.25) on the level of alliances as *Corynephorion canescens* (25 d.s., Sharpness = 74.74), *Koelerion glaucae* (15 d.s., S = 38.32), *Festucion beckeri* (10 d.s., S = 26.50), *Agrostion vinealis* (4 d.s., S = 6.95), *Bromo pannonici-Festucion pallentis* (48 d.s., S = 70.11), *Trifolion montani* (20 d.s., S = 36.73), *Cirsio-Brachypodion pinnati* (30 d.s., S = 39.67), *Festucion valesiacae* (21 d.s., S = 27.69). Differences between alliances are reflect in ecological analysis: *Agrostion vinealis* and *Trifolion montani* alliances characterized by the highest values of moisture and nutrients, *Bromo pannonici-Festucion pallentis*, *Trifolion montani*, *Cirsio-Brachypodion pinnati* and *Festucion valesiacae* distinguished by high values of pH. Composition of the Sociological Species Groups is also good index of the difference between classes: presence of *Corynephorus canescens*, *Festuca beckeri*, *Koeleria glauca* and *Secale sylvestre* groups allowed to identify the *Koelerio-Corynephoretea* class, *Stipa capillata*, *Teucrium pannonicum*, *Salvia nutans*, *Stipa lessingiana*, *Carex humilis*, *Salvia nemorosa* and *Thymus marschallianus* groups characterized the *Festuco-Brometea* class, absence of these groups with simultaneous presence of *Arrhenatherum elatius*, *Leucanthemum vulgare*, *Poa pratensis* and *Koeleria delavignei* groups is typical for *Galietalia order* of the *Molinio-Arrhenatheretea* class; *Poa angustifolia*, *Achillea millefolium* and *Trifolium montanum* groups are present in communities of the three classes.

BIOLOGICAL SOIL CRUSTS OF TWO SUCCESSIONAL STAGES IN PIONEER SAND GRASSLAND

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18 random samples (400 cmI) of both types were taken. Direct determinations were made out of four subsamples. Enrichments cultures were exposed 3-6 months (room temperature, ca. 500 µmol photons m-2 s-1, light:dark regime 10:14 h) before determination. The data were analyzed by t or U tests and detrended correspondence analysis (DCA).
In total, 45 species of cyanobacteria and eukaryotic algae were detected in the study area with both techniques (26 eukaryotic algae and 19 cyanobacteria species). With both determination techniques, 22 identical taxa were detected. In the cultures, eight eukaryotic algae and two cyanobacteria species were exclusively found, whereas seven eukaryotic algae and six cyanobacteria species were only determined directly.
The DCA showed that the BSCs of both successional stages were clearly distinct communities, but ca. one half of the taxa occurred in both crust stages. Indicator species of initial crusts were *Klebsormidium flaccidum*, *Klebsormidium* cf. *klebsii* and *Stichococcus bacillaris*, of stable crusts *Tortella inclinata*.
During succession, there was a significant decrease in the biodiversity of cyanobacteria and eukaryotic algae, whereas the biodiversity of vascular plants and bryophytes significantly increased. Both stages of are diversity “hot spots” with a mean total species number of about 29 per 400 cmI.
Thus, hypotheses 1 2 are confirmed, while hypothesis 3 is taxa-dependent.

Langhans, T.M., Storm, C. & Schwabe, A. (2009): Community assembly of biological soil crusts of different successional stages in a temperate sand ecosystem, as assessed by direct determination and enrichment techniques. Microbial Ecology 58: 394-407.

MANAGEMENT AND PRESERVATION OF DRY MEADOW HABITATS IN URBAN AREAS ENHANCES CARABID DIVERSITY (COLEOPTERA, CARABIDAE)

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Urban meadows are threatened environments, and ecological information is crucial in order to conserve and manage their rich biodiversity. The aims of our study were to 1) assess the ground beetle assemblages in meadows of potentially high conservation value and 2) investigate the effects of meadow management and urbanization on the composition of carabid assemblages. The fieldwork was conducted during May – September 2008. We pitfall-trapped carabid beetles in 12 urban and suburban meadows in the Helsinki metropolitan region, Finland and compared sites that require management with drier ones that do not need management. A total of 78 species of ground beetles, including rare species, were found during the study. The species composition differed significantly between the treatments and species richness differed between sites. There was greater evenness in unmanaged meadows than in managed ones, where one species tended to be highly dominant. Species composition was much more dependent on the vegetation type than on management. Analysis of individual species using Generalized Linear Model (GLM) showed that several species associated with open and dry habitats favoured urban dry meadows over the more rural ones. In conclusion, urban meadows can support high carabid diversity and rare species occurrence if managed for openness.

FORMATION OF VEGETATION OF *Astragalo-Stipion* Knapp 1944 ALLIANCE OF THE BOUNDARY BETWEEN FOREST-STEPPE AND STEPPE OF THE RIGHT BANK OF THE DNIEPRO REGION OF UKRAINE

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Our investigation is directed to the establishment of phytocoenotic features of the boundary between natural zones. The object of our investigation is chosen the boundary between forest-steppe and steppe zones of the right bank of the Dniepro region of Ukraine. On the territory of investigation, we was studied the steppe vegetation alliance *Astragalo-Stipion* Knapp 1944. 88 standard geobotanical relevés were perfomed by author in 2004-2006. The database was formed with the help of the software Ficen2. The data processing was done by the method of the phytocoenotic tables reorganization. Microsoft Excel was used for editing and separating of syntaxonomical units of different ranges. Alliance *Astragalo-Stipion* combines xerophytic, southern forb-grass typical steppe communities. In the floristic composition of these communities are dominated species of the genus *Stipa* and substantially containing species from the family *Fabaceae*. Communities of alliance occupy different parts of gentle or medium-steep slopes of different exposure. Vegetation cover is well developed. In locations with high anthropogenic influence is observed liquefaction of plant cover and impoverishment of the floristic composition. Communities are forming on the typical and ordinary chernozem. As the result of data obtained we determined that the alliance *Astragalo-Stipion* represented by such associations: *Stipetum lessingianae* Soo 1948, *Stipetum lessingianae* var. *Lathyrus tuberosus* nov, *Thymo marschalliani-Crinitarietum villosae* Korotchenko et Diduch 1997, *Teucrio pannonici - Stipetum capillatae* Diduch, Korotchenko 2000, *Vinco herbaceae-Caraganetum fruticis* Korotchenko et Diduch 1997, *Astragalo austriaci-Salvietum nutantis* Korotchenko et Diduch 1997. The main feature of these results is that the steppe alliance *Astragalo-Stipion* represented on the northern border of the steppe and forest-steppe replaced by steppe vegetation alliance *Fragario viridis-Trifolion montani*.

VEGETATION DIVERSITY OF URBAN MEADOWS IN THE HELSINKI METROPOLITAN REGION

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Sprawling urban regions often contain remnants of semi-natural habitats that, with appropriate management, can provide suitable environments for threatened species. However, little is known about the influences of urbanization on meadow assemblages. Here we present results of a study on plant diversity in relation to environmental factors and management for 19 grassland habitat sites in the Helsinki metropolitan region, on the southern coast of Finland during the summer of 2007. All the meadows are lowland grasslands on acid soil and bedrock (pH 5.0-6.0). The diversity of plant species is lower in urban meadows than in rural meadows, which often may have more than 25-30 species/m2, especially in the case of traditionally managed or grazed mesic grasslands. Management of urban meadows successfully mitigates eutrophication and the associated increase in the abundance of tall grasses caused by increased N deposition, and hence promotes the occurrence of forbs that are typical of open, dry lowland grassland on acid soil, which is low in N and P.

FLORISTIC VALUE OF KURGANS VERSUS FLORA OF THE RESERVES IN THE WEST PONTIC GRASS STEPPE ZONE (SOUTHERN UKRAINE)

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The steppe and forest steppe zones in Ukraine have been strongly transformed by man and over 80% of the steppe area has been converted into fields. In the present study the character and floristic value of 26 kurgans (among 120 visited) in the west Pontic grass steppe zone were determined and compared to the flora of three steppe reserves established within the above zone. The flora of the investigated reserves ('Askaniya Nova', 'Yakovlivs'kii', 'Lesovii Kan'ion') was typical of the west Pontic grass steppe zone but differed between these reserves. 'Askaniya Nova' reserve contains significant areas of the steppe, as well as shallow depressions with no outflow (called 'pods') with specific flora. 'Yakovlivs'kii' reserve consists of a high number of typical steppe species as well as relatively high proportion of petrophilous plants (xerophilous and thermophilous vegetation on outcrops). The flora of 'Lesovii Kan'ion' is associated with deep gullies developed on loess-and clay-derived soils.
The species richness and the structure of the flora were compared. Particular attention was paid to the proportion of non-synanthropic species, steppe species, sozophytes as well as to the spectrum of synanthropes. A total of 355 species of vascular plants were recorded on 26 kurgans. Among these species, natives comprised 70,5% of the total flora of kurgans investigated, non-synathropes – 38,9%, steppe species – 56,1%, particularly valuable threatened taxa (sozophytes) – 5,1%. The comparative analysis showed that, in terms of structure of the flora, the flora of kurgans resembles that of the steppe reserves, which indicates that kurgans have high floristic value. It was found that the structure of the flora of the reserve on loess soils ('Lesovii Kan'ion') was most similar to that of the flora of the kurgans.
The relationships between the total flora of kurgans and the investigated reserves, based on the species composition, were analysed using indirect ordination (CANOCO computer software), which confirmed that the 'Askaniya Nova' reserve was most distinct with regard to the flora, and the flora of the kurgans was most similar to that of the 'Lesovii Kan'ion' reserve.
The reserves compared represent different types of grasslands of the Pontic grass steppe zone. The greatest floristic similarity between the kurgans and 'Lesovii Kan'ion' is attributed to the loess soils at both of these sites and absence of outcrops and 'pods'.

PERSPECTIVES OF PROTECTED AREAS NETWORK EXPANSION ON THE KERCH PENINSULA, UKRAINE

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According to recent estimates, less than 4% of the natural steppe zone remains in its intact state in Ukraine. However, this may well be an underestimation, as steppe vegetation has either survived or revived over considerable areas in a number of regions. One of these is the Kerch Peninsula in the Crimea, which is among the most valuable steppe regions of our country. The depression of agricultural activity in the 1990s launched steppe herbage recovery on tilled areas, which has resulted in its increased importance for the zonal biota. Besides steppe, valuable wetlands persist in the region. To date, there are natural herds here, as well as regions that can serve as natural passageways (coastal strips, steppe river valleys, as well as old fortifications). The total area of these lands exceeds 50% of the area of the peninsula. Most of these areas are not protected neither formally nor in fact. Today, natural complexes of the peninsula are only protected in two small reserves, Opukski (1592.3 ha) and Kazantipski (450.1 ha), and the recently created regional landscape park (RLP) Karalarski (6806 ha) the prospects of which raise many questions. Ten natural memorials and two reserves of regional and national significance have also been created in the region with the inland area totalling 9516.4 ha. Clearly, these entities do not embrace all the diversity of local ecosystems, accounting just for 3% of the area of the peninsula (total area is 325,500 ha). Nonetheless, they could serve as benchmarks for further development of the network of protected areas in Crimea via incorporation of valuable verging regions and creation of new protected areas (even without staff) subordinate to the existing reserves and RLPs of the region. Conservation of valuable natural territories on the peninsula should go in complex with conservation of historical and archeological areals, with designing the latter as historical and archeological reserves or as entities of historical and cultural heritage.

We divided the valuable areas we inspected in two groups: 1) those located in the northern part of the peninsula (north of the Prymorske-Kerch highway) and 2) those from the southern part (south of the highway). Such a division is not devoid of some practical sense, because in this way, the northern areas fall under the purview of the Kazantipski reserve and the Karalarski RLP, and the southern group is maintained by the Opukski reserve.

VEGETATION OF ABANDONED FIELDS IN UKRAINE

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The over-growth of abandoned fields and their further usage is of current interest now in Ukraine. It concerns those fields, which had not been tilled from autumn for more than one year and not prepared for fallows. According to gradual change of vegetation of abandoned field, the several types of abandoned field successions are distinguished.
For the first years a weed fallow is appear, which is formed mainly by annual explerents (*Stenactis annua, Erigeron canadensis, E. acris, Filago minima*). Next succession stage (up to 10 years) is characterized by addition of gramineus and elimination of annual weeds (*Elytrigia repens, Calamagrostis epigeios, Poa pretense, Festuca sp., Hypericum perforatum, Helichrysum arenarium, Matricaria perforata, Chamomilla recutita*). Unregulated over-growth of abandoned fields and close disposition to forests in Forest and Forest-Steppe zones can be the reason of appearance of bushes and shrubs and ligneous species (*Genista tinctoria, Chamaecytisus sp., Solidago canadensis, Acer negundo*). Also, the absence of seed bank of phanerophytes in the soils together with favorable edaphic and climatic conditions may cause the development of abandoned field of meadow and steppic types.
The classification of abandoned field vegetation is complicated because these vegetation communities form unstable succession stages, therefore these issues needs more elaboration.

EFFECTS OF CUT MOWING AND GRAZING WITH HUNGARIAN GREY CATTLE ON SPECIES COMPOSITION AND BIOMASS PRODUCTIVITY ON PANNON GRASSLANDS

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Phytosociological samples were collected: grassland stands with low intensity grazing (under-grazed pasture), overgrazed pastures, meadows (hayfield) and the stands where animals drinking. The areas were suitable for following up the changes of vegetation and production in every grazing season of a year. 5 pieces of 2Ч2 m phytosociological samples were examined on each sample area in April, May, June, August and September.
In case of the undergrazed pastures low number of species was detected in the and the control area. About one month per year grazing time in the undergrazed area was not enough to achieve a better state for species diversity, and the amount of forage remained high. The overgrazed pasture carries a low forage value and contains a high number of weed species, despite the spectacularly high total number of plant species, consequently, grazing pressure has to be decreased. Although the number of species is lower in the hayfield, species composition and ability for forage supply is much better, showing that the proper management of the area is taken here.

RARE AND ENDANGERED STEPPE BULB AND BULBOTUBERIFEROUS PLANTS: CAUSES OF RARITY, *EX SITU* AND *IN SITU* CONSERVATION

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Steppe areas are situated in Crimea Peninsula, steppe and forest-steppe zones in Ukraine. Unfortunately, only near 3% of natural and semi natural steppes are saved in Ukraine at present, though it was till 40% of country territory in the past. One from important components in life of steppe ecosystems is bulb and bulbotuberiferous plants which have big value for people also, because they are ornamental, medical and food plants. There are 88 species of bulb and bulbotuberiferous plants in steppes of Ukraine (it is about 66% from all bulb and bulbotuberiferous plants of the flora of Ukraine). These plants are in structure of 6 families (*Alliaceae, Amaryllidaceae, Hyacinthaceae, Iridaceae, Liliaceae, Melanthiaceae*) and 14 genera. More presented genera are *Allium* L. (28 species), *Gagea* Salisb. (23 species), *Ornithogalum* L. (12 species) and *Tulipa* L. (7 species). There are 28 species of bulb and bulbotuberiferous plants of Ukrainian steppes included in the Red Data Book of Ukraine (2009), 7 species - in the IUCN Red List, 8 species - in the European Red List and 2 species - in Annexes of Bern Convention. Thus, 32 species of these plants have state or international status of protection.

What are causes of rarity of these plants? First of all, it is powerful anthropogenic influence on steppe ecosystems in forms of destruction of integrity of soil cover (ploughing up, mining operations and excavations), burning, pasturing, mowing and purposeful use of some species by local population. All it had destructed majority of natural habitats of bulb and bulbotuberiferous plants in steppes of Ukraine during last 200-300 years. Secondly, causes of rare status of some bulb and bulbotuberiferous plants are natural rarity. For example, *Ornithogalum melancholicum* Klokov ex A. Krasnova and *Colchicum fominii* Bordz. are endemic of narrow territories

Allium lineare L. is relict of “near glacial” steppes, *Tulipa gesneriana* L., *Ornithogalum oreoides* Zahar. and others have borders of its distribution in the Ukrainian steppes.

Majority of studied species are represented in protected territories and botanical gardens of Ukraine, but *Colchicum fominii*, *Ortithogalum amphibolum* Zahar. and some other species aren’t in territories of Biosphere and Natural Reserves, National Natural Parks of Ukraine. *Allium savranicum* Besser, *Ornithogalum oreoides* Zahar. and some other species aren’t in living collections of Ukrainian botanical gardens and dendroparks still now.

PHYTOCOENOTIC RANGE OF *Orobanche coerulescens* Stephan ex Willd. IN POLAND AGAINST A BACKGROUND OF CENTRAL EUROPE

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Orobanche coerulescens represents the Euro-Asian type of distribution. The species is recognized as extinct at the majority of its localities at the western limit of its distribution. Its populations are very scarce in Central Europe. The species parasitizes mainly *Artemisia campestris*. Data on the phytocoenotic amplitude of *O. coerulescens* are insufficient. In Europe, the species has been recorded mainly in the communities of the *Festucetalia valesiacae* order: *Festucion valesiacae*, *Alysso-Festucion pallentis* (*Potentillo arenariae-Festucenion pallentis*) and *Helichryso-Festucetum* (*Brometalia erecti*).
The species is known in Poland from now historical localities in Pomerania. It was recently recorded at single localities in the Podlaski Przelom Bugu gap, the Wyzyna Malopolska upland, Wysoczyzna Dorohiczynska and Wzniesienia Lodzkie hills. The bluish broomrape grows on calcareous sands in a thermophilous grasslands, gravel pit, fallows and arable fields, with a high number of species of the *Koelerion glaucae* alliance, *Sileno otitis-Festucetum* (*Koelerio glaucae-Corynephoretea canescentis* class) and an admixture of xerophytes (*Festucetalia valesiacae*), meadow (*Arrhenatheretalia*), ruderal (*Onopordetalia*, *Echio-Melilioletum*) and segetal (*Stellarietea mediae*) species at the present localities.

DISTRIBUTION AND CONSERVATION OF *Bothriochoa ischaemum* (L.) Keng AT THE NORTHERN LIMITS OF ITS GEOGRAPHICAL RANGE

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Bothriochoa ischaemum (L.) Keng ia a rare species of xerotermic swards, character of the *Festuco-Brometea* class. In the lowland it grows mainly in the south-eastern regions of Poland, in the Wyzyna Małopolska, in the Kotlina Chodelska and in the Wzniesienia Urzedowskie. One locality is situated to the north in Poznan (Wysocki 2005, Podsiedlik 2007). Within the examined area, it was noted and collected in Kielce, Krakow, Lublin and Poznan. The localities were visited during the last few years 2004-2010. *Bothriochloa ischaemum* grows in the nature reserve, the Landscape Park, the Natura 2000 sites. The currently existing network of protected areas does not sufficiently protect the examined taxa. Part of the population from the most threatened locations should be taken for cultivation in the newly created Botanical Garden in Kielce. In the experts's opinion (Frey 2008), this species should be included in the ,,red list" of threatened plants in Poland (according to criteria given by IUCN 2001).

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PROTECTED STEPPE VASCULAR PLANTS IN PROTECTED AREAS AND AGRICULTURAL LANDSCAPES OF ODESSA REGION (UKRAINE)

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Odessa Region entirely is a steppe zone: the northern part is forest-steppe subzone, other territory is steppe subzone. There are all the zone types of steppe (meadow, herb-bunch-grass, bunchgrass, semidesertic) and their edaphic varieties fragments (psammophytic, halophytic, petrophytic). Therefore vascular plant Red List of Odessa Region includes a lot of protected species.

In 2009 there was a third edition of the Red Book of Ukraine, and a second edition of the Green Book of Ukraine. On February, 18th 2011 Odessa country council has confirmed «the List of species of animals and the plants which are subject to special protection in territory of the Odessa area». According these new Lists analysis of rare species is actual.

On 25/08/2010 there were 120 protected objects and territories in Odessa Region. Only 19 of them have steppe areas. The largest steppe square is in regional landscape park "Tiligulsky". 16 territories with steppe fragments are reserved, their square is more than 3000 hectares. The most valuable among the perspective protected territories (out of this list) are National nature park "Kujalnik" and regional landscape park «Tarutinsky steppe".

There are 234 protected vascular plant species in Odessa Region, 99 species of which grow in steppe phytocenoses. Red Data Book of Ukraine includes 54 species, European Red List – 15, 38 are of local protected level.

As our accounts testify 59 species grow on protected territories, 40 species – out of them.

17 species are in perspective protected territories (since 1993). Without actual or perspective protection there are 23 species, including 13 species from Red Data Book of Ukraine, 3 – from European Red List and 7 local species.

According our information 78 steppe vascular plants (79% of all the list) grow in agricultural landscapes (natural cuttings, pastures, fallows, forest strips). The most of all species grow in natural pasture and unsuitable lands. A lot of plants are in natural cuttings and forest strips. Obviously, forest strips play an important role in preservation of some protected species.

Some protected species grow in fallows. Dominants of a vegetative cover of steppes – Stipa – appear here also. It testifies to considerable self-regenerative potential of steppe vegetation.

Some role in preservation of rare species is played by local population - on personal plots 11 species are grown up, including 7 species from Red Data Book of Ukraine.

LITHUANIAN DRY GRASSLANDS: UNSOLVED PROBLEMS

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In Lithuania, which is situated between boreal and temperate vegetation zones, dry grasslands of *Festuco-Brometea*, *Trifolio-Geranietea* and *Koelerio-Corynephoretea* classes are considered as azonal and relict plant communities. Their apparent uniqueness constantly prompted researchers' interest in these communities, but the changing natural environment, new data and new approaches highlight the shortfalls of knowledge on Lithuanian dry grasslands.

Diversity. Previously described syntaxonomical diversity (1998) should be revised. Evaluation of locally described units, including *Poetum compressae* and *Helictrotricho pubescentis-Filipenduletum vulgaris*, is very important.

Distribution. According to the results of National Grassland Inventory (2005), dry grasslands that represent the indicated three syntaxa cover 2.700 hectares. However, these data were not complete, as the inventory did not cover all the territory of Lithuania. The distribution areas of phytosociologically interesting dry grasslands with *Cirsium acaule* and *Carex flacca* in the northern and western parts of the country were not ascertained.

Situation on landscape. Degradation of species composition and structure due to discontinued land use are the main current trends of succession in dry grassland communities. There are about 200 nature management plans prepared in Lithuania, but the management measures for dry grassland habitats (2330, 6120, 6210) cover only about 150 hectares in total. The implementation of these plans has not been started in most sites yet, therefore, the effectiveness of management measures cannot be evaluated.

THE EFFECT OF LAND USE HISTORY AND HABITAT FRAGMENTATION ON THE PLANT SPECIES RICHNESS AND COMPOSITION OF PANNONIAN SAND FOREST-STEPPE VEGETATION

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The remaining fragments of Pannonian forest-steppe are seriously threatened by the effects of present and past land use. In our research we analyze the effects of habitat fragmentation on seminatural stands Pannonian sand forest steppe vegetation.
We sampled 161 relevés of 400 m^2 in six forest-steppe habitat types of 16 differently used landscapes of the Kiskunság, central Hungary. We analyzed the species number and the composition of relevés as a function of present and past land use intensity of the surrounding landscape.
Our results suggest that the floristic composition of the seminatural open and closed steppe oak forest stands depends on the past land use. Forest specialist species are missing from spontaneous and planted secondary forests on earlier grassland or agricultural areas. Most stands are heavily infected by invasive species.
The species composition of grasslands has significant regeneration potential in this region. Most grassland specialists are able to colonize in secondary stands. The species pool can survive for long time in small fragments of seminatural grasslands. The presence of the seminatural forest in the surrounding landscape has a positive effect on the number of grasslands specialists. Invasion is a major threat, only the largest undisturbed grasslands can resist.
The resilience of grasslands depends on their soil conditions. Closed grasslands of nutrient-rich soils in deeper elevations are more resistant to invasive species, but they lose their specialists if they are fragmented and overused. The specialists of open grasslands on nutrient-poor sand soils can easily survive and recolonise, but their stands are more vulnerable to invasion.

THE SYNTAXONOMY OF CLASS *Festuco-Brometea* Br.-Bl. et R.Tx in Br.-Bl. 1943 AT THE DINARIC ALPS (W. BALKAN)

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Thermophilous vegetation of grassland and pastures in the Dinarides is being developed on carbonate bedrock, at the vertical profile between 200m and 1550m. Going from the Mediterranean belt, this class makes syndynamic relationship with vegetation of rocky grasslands of class *Thero-Brachypodietea*. At the old volcanic rocks, the vegetation is in close connection with the class *Festucetea vaginatae*. In the sub-alpine area, the vegetation continues to sub- alpine pastures of class *Elyno-Seslerietea*.
The climatogenous vegetation on the distribution of vegetation class *Festuco-Brometea* are: *Quercion troyanae*, *Ostryo-Carpinion orientalis*, *Seslerio-Ostryon*, *Quercion petreae-pubescentis*, *Quercion petreae-cerris*, *Seslerio-Fagion*, *Abieti-Piceion* and *Picion abietis*.
By using the method of Braun-Blanquet made more than 1000 releves. Releves were later grouped in the analytical and the synthetic tables. Vegetation class *Festuco-Brometea* at the Dinarides to be differentiated at the orders: *Brometalia erecti*, *Scorzonero-Chrysopogonetalia* and *Koelerietalia splendentis*. The order *Brometalia erecti* differentiated in the alliances: *Cirsio acauli-Bromion erecti*, *Carici humilis-Bromion erecti* and *Fumano-Scabiosion leucophyllae*. The alliance *Cirsio acauli-Bromion* inhabits the coldest habitats. It differentiated in the alliances: *Gentiano tergestinae-Crepidenion dinaricae*, *Filipendulo vulgaris-Danthonenion alpinae* and *Cirsio acauli-Bromenion erecti*. Order *Scorzoneretalia villosae* includes alliances: *Scorzonerion villosae*, *Saturejion subspicatae* and *Saturejion montanae*.
The vegetation of the class includes more than 50 associations. In the composition of this vegetation is around 1 500 plant species. Many of them are endemic, and some and relict, that to differentiate those communities from similar vegetation of other parts of Europe.

RESPONSES OF GRASSLAND SPECIES RICHNESS TO LOCAL AND LANDSCAPE FACTORS DEPEND ON SPATIAL SCALE AND HABITAT SPECIALISATION

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Present study explores the relationships between grassland species richness and a series of local and landscape factors and we explore to what extent do the responses of species richness depend on the degree of habitat specialization (specialists vs. generalists) and/or the scale of the study (plot vs. patch)?

Richness of all herbaceous vascular plants was recorded within 50 Ч 50 cm plots and within (0.1-4.8 ha) grassland polygons within a local agricultural landscape on the Baltic island Öland, Sweden, and total richness was subdivided into the richness of grassland specialists and generalists. Multivariate linear models and hierarchical partitioning were used to identify local factors (habitat area and heterogeneity, grazing intensity, habitat age) and landscape factors (the proportion of surrounding grassland in 2004, 1938 and 1800 and surrounding landscape diversity in 2004) that were significantly associated with species richness.

The responses of plant species richness to local and landscape factors depended on the degree of habitat specialization and on the scale of the sampling. On the polygon scale, the richness of both specialists and generalists was positively associated with habitat area and heterogeneity, grazing intensity, habitat age and the proportion of surrounding grassland in 1800. On the plot scale, specialist species richness was positively associated with habitat heterogeneity, the proportion of surrounding grassland in 2004, and landscape diversity. Plot-scale generalist species richness, on the other hand, was negatively associated with the proportion of surrounding grassland in 1938 and positively associated with grazing intensity.

On the large (polygon) scale, the levels of species richness of grassland specialists and generalists are influenced by similar processes, and both specialist and generalist plants have accumulated in the old grasslands over centuries of grassland management. On the fine (plot) scale, levels of species richness of specialists and generalists are influenced by different processes: while specialist species are sensitive to grassland isolation, generalist species may benefit from habitat isolation.

DIVERSITY OF DRY AND WET SEMI-NATURAL GRASSLAND ECOCLINES IN RIVERINE LANDSCAPE: IMPORTANCE OF MANAGEMENT HISTORY AND TOPOGRAPHICAL HETEROGENEITY

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Floodplains are disturbance-governed ecosystems characterized by high landscape heterogeneity. Floodplains of traditional agricultural landscapes are mostly dominated by semi-natural grassland vegetation. Microtopography formed by erosional and depositional processes of a river provide conditions for high density of transitional zones between different habitats. Much of the floristic diversity is attributable to such transitional zones at the habitat scale. While forest-grassland boundaries have often been investigated, the transitional zones between different plant communities of the same vegetation type have gained far less attention. The aim of this research is to ascertain the diversity of dry-wet semi-natural grassland ecoclines in riverine landscape in the light of landscape topographical heterogeneity and management history.
The research was carried out in Northern Latvia in two landscapes of the Gauja River dominated by *Festuco-Brometea* grasslands with *Magnocaricetalia* grasslands in depressions. Both landscapes differed in topographical and vegetation heterogeneity and management history. In total, 11 ecoclines were sampled in 1 m wide and 8 to 28 m long belt transects gridded into 0.5 x 1 m plots. The position and the width of the ecoclines were determined by the DCA ordination scores with the moving-window regression method. Differences in species composition between ecocline and adjacent vegetation were analyzed by Cluster Analysis and Indicator Species Analysis.
Ecocline width varied from 2 to 10 m, species diversity was much higher in ecoclines than in wet grasslands but slightly lower than in dry grasslands. Several species occurred considerably more frequently within ecoclines than in the adjacent communities. No species were restricted entirely to an ecocline. High within-habitat heterogeneity of dry grasslands could be responsible for this pattern. Ecoclines of heterogeneous landscape were longer, less sharp, and richer in species than those of homogeneous landscape. It can be explained by steeper moisture gradient as slopes of oxbow-lakes and depressions were generally steeper in homogenous landscape. Mowing once in the mid-summer has created uniform vegetation with sharp boundaries between dry and wet grasslands in homogenous landscape. Year round grazing combined with mowing in late summer could be a factor accelerating dispersal of dry and wet grassland species and their establishment in ecoclines of heterogeneous landscape.

DRY GRASSLANDS OF THE SOUTH COAST OF THE CRIMEA

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The South Coast of the Crimea is a narrow strip of the coastal area (one to twelve km wide) between the main ridge of the Crimea Mountains and the Black Sea. Geologically, it consists of rocks of different origin, such as limestones, conglomerates, argillaceous schists and magmatic rocks. This is the only area in Ukraine with a climate similar to the subtropical Mediterranean type, which underlies the specific features of its vegetation.
According to J. Braun-Blanquet's system three classes of plant communities represent dry grasslands of the South Coast of the Crimea, namely *Festuco-Brometea, Thero-Brachypodietea* and *Koelerio-Corynephoretea*. The *Festuco-Brometea* class embraces true and petrophyte steppes of the order *Brometalia erecti*. These are dominated by *Stipa pontica*, *S. capillata*, *S. lessingiana*, *Festuca valesiaca*, *F. callieri*, *Bromopsis cappadocica*, *Bothriochloa ischaemum*, *Agropyron ponticum*, *A. pectinatum*, *Elytrigia nodosa* with an active participation of *Carex hallerana*, *Linum tenuifolium*, *Leontodon crispus*, *Convolvulus cantabrica* and other species. On the north-east of the South Coast of the Crimea, the steppes enter as the zonal type of vegetation and distinguish themselves for a high floristic and phytocenotic diversity. Only petrophyte variants of steppes are sparsely found in the south-west of the region.
The communities of the *Thero-Brachypodietea* class are spread in the lower altitudinal belt, for the major part on limestone and schist slopes. They belong to the order *Thero-Brachypodietalia* and the alliance *Thero-Brachypodion*. The therophytes of Mediterranean origin *Aegilops biuncialis, Ae. triuncialis, Helianthemum salicifolium, Clypeola jonthlaspi, Trifolium scabrum, T. campestre, Crupina vulgaris, Linaria simplex, Hippocrepis unisiliquosa, Minuartia pseudohybrida* are important in their floristic composition.
The vegetation of the class *Koelerio-Corynephoretea* (order *Sedo-Scleranthetalia*) is found by small plots on the outcrops of schists, hornstones and magmatic rocks. The ephemers (*Vicia lathyroides, Psilurus incurvus, Holosteum umbellatum, Filago arvensis, Trifolium hirtum, T. arvense, Alyssum umbellatum, Sedum caespitosum, Myosotis* spp*., Veronica* spp.) also predominate in these phytocenoses.
Dry grasslands in the south-west part of the South Coast of the Crimea fall into the category of rare plant communities and are in need of special protection measures because of a high anthropogenic load.

PRODUCTIVITY OF THE DRY STEPPES OF TUVA UNDER THE GRAZING PRESSURE

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In this study we were presented changing of the species structure, plant communities and productivity of the grassland ecosystems under the influence of the grazing pressure on the dry steppes of Tuva. Steppes are grazed and represent different stages of succession.
In the dry steppes plant communities, aboveground biomass was composed almost entirely of plant material from the dominant sedge species.
Difference between moderately grazed and overgrazed sites may arise mainly from the different factors that originate their xerophytic character: soil and climatic characteristics, respectively. Summers are very cool and the winters are hot and the soil with a low water storage capacity in the central Asia.
Moderately grazing of tuvinian dry steppes is resulted in higher species richness of the vascular plant, biomass values for the above- and below-ground production for 0–20 cm soil layer, entering of the vegetable leavings to the soil, net primary production, the storage of the humus, carbon.

MANIPULATING POLLINATION SUCCESS BY CHANGING PLANT COMMUNITY STRUCTURE – THE ROLE OF SPECIES' DENSITY AND SPATIAL PATTERN

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Dry grasslands are well known for their high species diversity. In such rich plant community it is expected that species reproductive success depends not only on their own traits but also on their neighboring traits. Although little is known about shared pollinators and the conditions governing them, we can predict that a highly attractive species will have a positive effect on its less attractive neighbors' pollination success as long as the pollinators have a restricted searching area. Therefore, the effect of pollinators is expected to be regulated by the different species densities. Similarly, the spatial distribution of an attractive species within the plant community may change the pollination success of other species in a mixed patch. Here, we present results of a field experiment in which the contribution of shared pollination services in highly diverse dry grasslands was tested by manipulating density and spatial pattern of a potential attractive species, *Centaurea cyanus*.

DRY GRASSLANDS IN GREEN DATA BOOK OF BRYANSK REGION: RESULTS AND PROSPECTS

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Dry grasslands are an important component of phytocoenotic diversity of Southern Nechernozemje of Russia (central part of European Russia). Due to the long-term management of this type of vegetation now more than 3000 releves are available to a floristic comparison or to classification with use of Braun-Blanquet approach.

In 2009 the project of the Green Data Book of Bryansk region was started. It suggests generalizing all the materials about distribution and floristic and ecological features of rare communities and communities which are need to protect in the region. Dry grasslands are represented in the future Book by 8 associations assigned to classes *Molinio–Arrhenatheretea* and *Koelerio–Corynephoretea*. These are predominantly the communities of stepped meadows and dry grasslands on sandy soils.

The description of the associations includes the information about the distribution, habitat, diagnostic species, typical floristic composition, syntaxonomy, aim and category of protection, recommendations to protection.

One of the problems facing us is the local character of some associations. Usually they aggregate communities with rare or protected species in the region (*Armeria vulgaris, Arrhenatherum elatius, Corynephorus canescens, Onobrychis arenaria* etc.). Another problem is the syntaxonomical position of some syntaxon which has the features of classes *Molinio–Arrhenatheretea* and *Festuco–Brometea*. Their syntaxonomy was developed in 90s and now it is need to review.

The Green Data Book of Bryansk region will be the first Green Data Book in Central European Russia. It will be the base for the ecological monitoring on the territories of regional reserves. Its creation will be the important reason for the integration of phytosociological studies in the region.

RE-INVENTORY RESULTS OF A VASCULAR FLORA OF THE ASCANIAN STEPPE FOR 2003–2010

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A history of stationary floristic researches of the ascanian steppe originates from the first part of XIX century – 1832–1843 years (Teetzmann, 1845); a line of detailed floristic reports of this territory with modern area 11054 ha exists, though a flora is naturally depleted: "… An amazing poorness of flora is striking first of all" (Пачоский, 1923, p. 135). However the goals and accents of modern floristic papers are not only increase of a general list of flora, but is its close revisions and reappraisal of critical and stale data.

According to the results of an analysis of previous floristic reports, the current re-inventory inspections for 2003–2010 and critical revision of herbarium collection a concept of vascular flora of the core area of the Biosphere reserve "Ascania Nova" makes up 509 species, that 33 species of them (6,5% of total flora capacity) are identified at first.

72 species were dedicated from a flora's list. A part of them is not concerned the territory of present core area; another part are combined as synonyms or excluded as doubtful references which are not confirmed by herbarium collections. 26 species are identified by us with critical taxonomic status or as problem flora' phytocomponents of the ascanian steppe. These are plants with probability of the growing but not recorded during current re-inventory.

It should be noted that about 292 synonyms from previous floristic reports of the ascanian steppe's flora and 149 incorrect nomenclatural names – "misapplied names" are collected at the given abstract. Thus, the results of all inventories of flora for 1845–2010 years are combined into integrated nomenclatural checklist with a common taxonomic interpretation the first. This checklist integrates 1022 taxonomic categories (the most of them – of "the present" species), only 509 (49,8%) of them represents an actual composition of flora.

The general parameters of systematic structure of the vascular flora of the core area and a position of a range of 10 key families are the following: *Asteraceae* – 82 види (16,1%), *Poaceae* – 61 (12,0%), *Fabaceae* – 39 (7,7%), *Brassicaceae* – 32 (6,3%), *Lamiaceae* – 26 (5,1%), *Caryophyllaceae* та *Chenopodiaceae* – по 24 (4,7%), *Cyperaceae* – 16 (3,1%), *Apiaceae* та *Veronicaceae* – по 15 (2,9%).

A capacity dynamics of the vascular flora of the ascanian steppe keeps progressive tendency till this time; the present changes of quantitative composition and structure of the vascular flora are determined by processes of phytoinvasions and sinanthropization.

RESTORATION OF DEGRADED LANDSCAPES IN THE STEPPE ZONE OF UKRAINE

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The science face the task of stating the scale and degree of anthropogenic changes of natural ecosystems, the ways of balanced use and recreation of their natural resources, keeping and developing their functions, re-naturalizing transformed ecosystems, their return to the sphere of nature use. The development of science-grounded measures of retaining, recreation and rational use of herbal ecosystems as the main natural resource for agricultural production are admitted to be of special significance. In the south of Ukraine the natural ecosystems are under great pressure, determined not only by agricultural loading directly, but also by complicated ecological situation of the region. Too extensive exploitation resulted in watershed steppes being devastated completely (the area of infields is 63%) and significant anthropogenic destruction their remains (over 200 thousand hectares are useless soils). Nowadays there are no precise scientific measures for recreation and rational use of vegetative cover in natural ecosystems that would not only keep phytodiversity, but also recreate agricultural value of steppes and meadows. The scientists of Donetsk Botanical Garden have made a considerable contribution to the study of natural and anthropogenic ecosystems of the region: they have been classified, structural and functional organization have been examined in detail and basic measures for restoration of destroyed ecosystems have been scientifically grounded. It concerns not only passive natural restoration which is possible only on particular stage of anthropogenic degradation of vegetative cover or if a sufficient seeds bank is available in the soil or in case above-mentioned plots of land are located near little violated steppe massifs. Taking particular measures to renaturalize actively vegetative cover that proved as well as developing and introducing optimal use regimes of existing and restored steppes are now topical results. It is accounted for by the fact that today's withdrawal of considerable areas from agricultural use are to be involved in sufficient activities of restoration of steppe vegetation. For such soils it is recommended to use the technology, developed by the scientists of Donetsk Botanical Garden, which consists in creating the diversity of fodder agrophytocoenoses, characterized by high productivity of feeder mass and stability of species composition within a long period of time (over 15 years), close to natural coenoses.

CHANGES IN SPECIES COMPOSITION IN GRASSLANDS CAUSED BY CHANGES IN MANAGEMENT DURING THE LAST 18-20 YEARS IN BIELE KARPATY MTS., SLOVAKIA

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Changes in species composition in grasslands caused by changes in management during the last 15-19 years were studied in Biele Karpaty Mts. Grassland vegetation was sampled in the years 1991-1995. The localisation of relevés was marked in maps of scale 1:10 000. The studied communities belong to the associations *Brachypodio pinnati-Molinietum arundinaceae* (*Bromion erecti*), *Pastinaco-Arrhenatheretum elatioris*, *Ranunculo bulbosi-Arrhenatheretum elatioris* and *Anthoxantho odorati-Agrostietum tenuis* (*Arrhenatherion elatioris*).
In 2010 the repeated phytosociology research were made on sites of former relevés. Re-sampling was based on marks of old relevés in maps and on the historical description of sites. No permanent plots had been marked during the first sampling period. Over the course of years the type of management was changed in many localities.
Detrended correspondence analysis (DCA) from the CANOCO 4.5 for Windows package was applied for the evaluation of changes in the studied vegetation and for ecological interpretation of the main gradients. Nonparametric statistic followed by Kruskal-Wallis ANOVA and Mann-Whitney U Test (Statica 8; http://www.statsoft.com/) were used to investigate whether the species richness was different among historical and recent relevés. Occurrence of different life forms and functional groups was compared between the old and new relevés. In many cases absence of any management led to succession changes in the community (decrease of number of species, increase of abundance of competitively strong species *Brachypodium pinnatum* or *Arrhenaheretum elatioris*, invasion of trees). Dicotyledonous herbs became rare in unmanaged stands. Several grasslands were changed into pastures.
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LARGE-SCALE POTENTIAL DISTRUBTION MODELS OF GRASSLAND HABITATS IN HUNGARY

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Grassland transformation due to human disturbance is especially pronounced in Hungary. The high level of transformation makes the assessment the potential distribution of grasslands difficult. Existing remnants might be misleading, partly because their stands might be the result of human interventions, partly because the environment has been transformed while the vegetation has survived.
Therefore, models are essential for the estimation of the potential distribution of natural grasslands. With our modeling approach, we aimed at finding the potential location of grassland habitats and at exploring differences in the determining abiotic constraints among different grassland types. Here a subset of potential distribution models will be shown, which were created based on data of actual natural vegetation from the MÉTA (Landscape Ecological Vegetation Mapping of Hungary) database, which contains among others presence/absence observations for each vegetation type of Hungary at the scale of 35 ha. Biologically relevant explanatory variables (including climate and soil conditions) were calculated for the whole extent of Hungary. Models were built using the gradient boosting algorithm (GBM), which tolerates correlation among predictors. Variable importance in individual models was assessed by cross-validation.
Model estimations for individual grassland types were supported by expert knowledge, both regarding explanatory variables and the predicted distribution. Widespread grassland types predominantly influenced by climate and soil were especially well modeled. Weak points emerged for habitats, which are already so rare that their actual distribution is not necessary reliably mirrors its requirements.
The use of GBM models proved to be useful, since variants of environmental descriptors (such as precipitation sums of different seasons) finely discriminated related vegetation types. An example is the differentiation of the explanatory model structure for steppes on stony grounds (mostly slopes) and loess steppes. Although these physiognomically similar habitats did share crucial explanatory variables, such as spring precipitation, they were also differentiated by temperature seasonality being more important for steppes on stony grounds, where the seasonality is indeed more pronounced.
Thus our models adequately reflect expert knowledge, with the added value of quantification and spatial allocation of environment-vegetation relationships.

RESTORATION POSSIBILITIES OF OVERPLANTED DRY GRASSLANDS IN THE TRANSYLVANIAN LOWLAND, ROMANIA

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Stipa-dominated dry grasslands are usually situated on steep, southern facing slopes in the Transylvanian Lowland. Traditionally they were used as pastures, but some of them had been afforested with locust-tree or black pine for economical reasons. Nowadays conservation objectives demand the restoration of overplanted sites of a still high nature conservation value.
The principal aim of our study was to explore the inherent resources of these plantations in achieving their former state as dry grassland by restoration. For this purpose a larger scale survey on plantations and nearby grasslands was conducted, the six stands being investigated by phytosociological sampling. The survey was completed with a seed-bank analysis on representative grassland - nearby plantation pair, situated in a protected area.
According to our results, planting pine strongly influenced the grassland communities: although Shannon diversity increased in the overplanted stands, the cover of herb-layer decreased significantly, especially formerly dominant grassland species withdrew, grassland specialists became underrepresented and scrubland species increased in abundance compared to grassland stands. Despite of these transformations, most of the grassland species were still present in planted sites, albeit their abundance was different from that in grasslands, and there were only a few grassland species missing as compared to grasslands.
Seed-bank analysis revealed higher seed densities in the studied overplanted site, with a strong representation of typical grassland species. The similarity between vegetation and seed-bank was low both for the plantation and grassland.
As in case of most restoration activities, dry-grassland recovery after forestation cannot exclusively rely on seed-bank. Due to the relative richness in typical grassland species of the seed-bank and relatively low abundance of ruderal species, it can represent an additional species source for restoring grasslands after deforestation. In case of plantations, both vegetation and seed-bank was found to be rich in scrubland species, therefore bush control should be a necessary intervention from the very beginning of the restoration actions. The high ratio of dry-grassland and grassland species in plantation sites points to the fact that there is no need for additional species introduction.

THE UKRAINIAN CARPATHIANS' XEROPHILOUS GRASSLANDS

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The climate conditions of the Ukrainian Carpathians – both temperature and especially high precipitation level (100-130 mm monthly in summer) are not favourable for development of xerophilous vegetation. Besides, the suitable habitats such as rocky outcrops, calcareous gravel etc. are scarce here. And so, there were no mention about dry grassland communities existence in any publication concerning grasslands and vegetation classification of the Ukrainian Carpathians till now.

During the execution of the BBI-MATRA/2007/004 project "Ukrainian Carpathians' grasslands inventory", supported by the Netherlands' Ministries of Agriculture, Nature and Food Quality and Foreign Affairs, several grassland communities described by project experts fall in Cl. *Trifolio-Geranietea sanguinei* Műll. 1962, Ord. *Origanetalia* Th. Műll. 1962, All. *Geranion sanguinei* R.Tx. 1961, All. *Trifolion medii* Th. Műll. 1961 764 and Cl. *Festuco-Brometea* Br.Bl. et R.Tx. 1943, Ord. *Festucetalia valesiaceae* Br.Bl. et R.Tx. 1943, All. *Cirsio-Brachypodion pinnati* Hadač et Klika 1944. Besides that on the scarce calcareous rocks patches of *Seslerietum heuflerianae* Soy 1949 and *Festuco rupicolae-Caricetum humilis* Klika 1939 occur, which according to palynological findings represent isolated remnants of the Late-glacial period and as such could be considered as natural.

The xerophilous and meso-xerophilous grasslands occur in dry and warm habitats, on diverse-oriented slopes of inclination even 45^0 within altitudinal range 200-750 m a.s.l. in submontane and lower part of montane belt.

The semi-dry grasslands are very species-rich with numerous rare and vulnerable species in their composition. They are mostly of secondary origin replacing former oak, oak-hornbeam and beech forests. Due to their location in the vicinity of settlements they are still traditionally used as one-time mowed hay-meadows, partly – as pastures. When abandoned are overgrown by bushes of *Pruno-rubion fruticosi* R.Tx. 1952 or *Prunion fruticosae* R.Tx. 1952 hence the floristic composition of these grassland areas depends upon the influence of men and their domesticated animals.

The studies on xerophilous grasslands in the Ukrainian Carpathians are now on their initial stage. Further researches are bound to give more data for their phytosociological classification and substantiation of means and methods for their conservation.

TECHNIQUES AND COSTS OF GRASSLAND RESTORATION ON FORMER CROPLANDS

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Restoration is widely applied to increase and preserve grassland biodiversity. Restoration techniques, like spontaneous succession, sowing seed mixtures, transfer of plant material, topsoil removal and transfer are frequently used to improve species richness and recover natural-like grasslands from ex-arable lands. We found that the success of each technique depends on the site conditions, history, availability of propagules and/or donor sites, and on the budget and time available for restoration. Spontaneous succession can be an option for restoration when no rapid result is expected, and promising where target grasslands are nearby. Sowing low-diversity seed mixtures is recommended to create basic grassland vegetation in short time with a low budget. High-diversity seed mixtures for large sites are expensive and difficult to compile. Thus, it may be applied rather on smaller areas. Combining low-diversity mixtures in a large area and high-diversity mixtures in small blocks is suitable to recover species rich grasslands. These species-rich patches may serve as sources for the spontaneous colonization into the species poor area. Restoration with plant material transfer can be a fast and effective method for restoration, but the cost can be high.

WEED SUPPRESSION AND SEED BANK IN EARLY GRASSLAND RESTORATION: CAN GRASSLAND RESTORATION BE USED FOR ECOLOGICAL WEED CONTROL?

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Grassland restoration on former croplands offers a great opportunity to mitigate the loss of grassland biodiversity. Weed suppression can be another benefit, which becomes increasingly important because of the high recent rate of abandonment of arable lands in Central and Eastern Europe. Our aim was to evaluate the usefulness of sowing two low-diversity seed mixtures followed by annual mowing, a frequently used restoration technique, in weed suppression. We found that rapidly forming cover of sown perennials effectively suppressed short-lived weeds and their germination except in the first year. Dense seed bank of short-lived weeds suggested that the restoration may have promoted the preservation of their seed banks which forms a possibility of later weed infestation. Perennial weeds cannot easily be suppressed by sowing and annual mowing in the short run. Fields sown with the same seed mixture but with different site history were dominated by different perennial weeds. Rapidly establishing perennial weeds, such as *Agropyron* species were only detected in former alfalfa fields. Conversely, *Cirsium arvense* was found in former cereal and sunflower fields but not in former alfalfa fields. These results indicate that post-restoration management may require carefully designed actions that are fine-tuned addressing threats at the site level.

MICROCLIMATIC FUNCTION OF VEGETATION IN THE SPA PIEŠŤANY (SLOVAKIA) AND ITS SURROUNDINGS

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The contribution deals with measurements of the near surface temperature of the selected ecosystems in relation to the cooling effect of the vegetation in the cultural landscape of the spa cadaster of Piešťany (Slovakia). On September 1, 2005 the air temperature and air humidity near the soil an vegetation surface of the 11 selected stands – asphalt, gravel bench near the river, corn field before harvesting, city park of Piešťany, three types of seminatural forests, mesophilous meadows with *Arrhenatherum elatius*, regulary mowed and abandoned meadows with *Bromus erectus* and *Typha latifolia* stand was measured as the indicators of their role in the regional hydrologic and climatic cycle. The results obtained so far demonstrated the importance of vegetation especially of its later succession stages concerning microclimate effects (and paralelly also other ecosystem services). This role of vegetation is directly related to the capacity of individual ecosystems to dissipate the sun energy (exergy), the largest part of which is transformed to the latent heat of water in the transpiration process (during the growing seasone). The importance of understanding this phenomena grows nowadays due to ongoing global climate change and consequent challenges of mitigating its impacts.
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USE OF LOW DIVERSITY SEED MIXTURE SOWING AND MULCHING IN RESTORATION: TESTING THE USEFULNESS OF COMBINATION OF THE TWO METHODS IN GRASSLAND RECOVERY

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Low diversity seed mixture sowing and mulching were applied in two former croplands (a former cereal field and one with a striped sowing of sunflower and maize) in Egyek-Pusztakycs region, NE Hungary. Early grassland recovery and weed suppression was studied. In each cropland two sample sites were marked and were sown with *Festuca pseudovina* in October 2008. Mulching with plant material originated form a species poor loess grassland was applied in one of the sites of both croplands in early November 2008. Vegetation and aboveground biomass was sampled in early June 2009 and 2010. We stated the following hypotheses: (i) The use of mulching combined with seed sowing is more effective in weed suppression than seeding alone (ii) The establishment of sown *Festuca pseudovina* was not hampered by the application of mulching. We found that seed sowing combined with mulching was more effective in weed suppression than seed sowing alone, but the rate of suppression was different in croplands with different site history. The cover of the sown *Festuca pseudovina* increased significantly from the first year to the second in both restoration types, but we found also increasing cover of the not sown *F. rupicola* in sites with seed sowing and mulching originated from the mulch applied. We found that the application of low diversity seed sowing and mulching was effective in weed suppression and facilitated the establishment of *Festuca* species. The combination of the two methods have advantages of both methods: seed sowing facilitates the fast development of perennial grass cover, while mulching is effective in weed suppression. If a seed rich material is used mulching can be a solution for propagule limitation.

RESAMPLING PLASTIC BEADS, A TOOL TO MODEL SEED BANK DEVELOPMENT AND PROPAGULE DISPERSAL IN DRY GRASSLANDS

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Soil seed banks and seed dispersal are among research highlights in vegetation science but major factors influencing them has been hardly quantified. The ways seeds are incorporated into the soil and agents in their dispersal on soil surface are little studied. In our project plastic beads are used as seed mimics. The size, shape and specific gravity of the applied beads falls into the range of seeds typical for the Central-European flora. We were out to study long-term (5 yrs) incorporation of particles into the soil and their surface transport. The effect i) of propagule size (small vs. large) and of shape (round vs. flattened), ii) that of soil type (light Humic Sand vs. heavier Meadow Solonetz with silty loam texture) and iii) that of management (fenced vs. grazed) are studied. Sampled vegetation types involve dry grasslands of the Nyнrség and Bihar regions, East-Hungary. Sand: *Corynephoretum canescentis, Festucetum vaginatae, Potentillo-Festucetum pseudovinae*. Solonetz: *Achilleo-Festucetum pseudovinae, Cynodonti-Poetum angustifoliae*. Particle size distribution and organic matter content as well as penetration resistance of soils is to be correlated with incorporation of beads. After the placement of 320,000 beads in the field in autumn 2008, recollection has taken place in every 6 months (April, October). Digging of small soil monoliths, cutting these into thin layers then washing out of plastic beads through a set of sieves are steps of data collection. Clear effect of bead size, of physical soil conditions as well as of land use on penetration and on dispersal were found. Depending on soil type and management small beads moved from the uppermost layer to lower ones 2.5 to 6 times more frequently than did the large ones. In Solonetz more beads penetrated into deeper layers than on Sand, which can be linked to the formation of more stable macropores in Solonetz due to its finer texture. Lower recovery rates of beads and more intensive penetration in grazed sites compared to fenced ones prove that domestic livestock plays an important role both in surface dispersal and seed bank development. Surface dispersal of large beads is more effected by grazing than that of smaller ones. Overall penetration is slow, most beads keep staying close to soil surface. After 18 months on sand 90% of recollected small and 96% of large beads rested in the uppermost 12.5 mm layer whereas for the upper 25 mm layers these figures were 96% and 99%, respectively.

DRY MEADOW AND STEPPE VEGETETION IN CENTRAL PODILLYA

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Central Podillya spreads on 15.000 sq. km and includes different plant communities of dry grasslands. Steppe and meadow vegetation are the most various there, but damaged by anthropogenic factor. We have made 203 geobotanical relevees in 2008-2009 and formed the phytocenological table based on the relevés made by prof. Y. Didukh and M. Fedoronchuk and on our investigations. Database was transformed with the help of FICEN 2 application and Microsoft Excel. We obtained the result by transforming the tables and distinguished Cl. *Molinio-Arrhenatheretea* and *Festuco-Brometea* vegetation. Plant communities of Cl. *Molinio-Arrhenatheretea* mainly predominate in the northern part of Central Podillya and in the valley of the Pivdennyi Buh River. Dry meadows of *Potentillo argenteae-Poion angustifoliae* alliance (Ass. *Festuco valesiaceae-Poetum angustifoliae*, *Poetum angustifoliae*) occupy meadow sod soils, *Agrostion vinealis* alliance (Ass. *Festuco valesiaceae-Agrostietum vinealis*) occupies sandy sod and sabulous soils and it is not represented on the territory. Plant communities of zonal vegetation of *Fragario viridis-Trifolion montani* alliance (Ass. *Thymo marschalliani-Caricetum praecocis*, *Salvio pratensis-Poetum angustifoliae*, *Medicago romanicae-Poetum angustifoliae*) are spread on the typical chernozem soils in the central part of the territory. The vegetation of *Astragalo-Stipion* alliance (Ass. *Vinco herbaceae-Caraganetum fruticis*, *Astragalo austriaci-Salvinetum nutansis*, *Teucrio pannonici-Stipetum capillatae*) is sporadically represented in the valley of the Dnister River. Plant communities of this alliance occupy calcareous soils-rendzinas. Derivative vegetation of *Festucion valesiaceae* alliance (Ass. *Carici humilis-Stipetum capillatae*, *Salvio nemorosae-Festucetum valesiaceae*, *Festuco valesiaceae*, *Botriochloetum ischameii*) is the consequence of pasture and is the most common vegetation in Central Podillya. Vegetation of *Cirsio-Brachipodion pinnatii* alliance is on the western boundary of the natural habitat. We found some fragments of this vegetation in the western part of Central Podillya.

URBAN DRY ROCKY MEADOWS ARE VALUABLE HABITATS FOR CARABID BEETLES

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Many urban regions contain remnants of cultural habitats, such as pastures and hay meadows. The Helsinki metropolitan region contains a network of dry meadow habitats comprising, in addition to cultural habitats, of dry rocky meadows and fortifications. The urban region also contains ruderal habitats and a diverse matrix of informal green space, which can also be valuable for maintaining dry meadow assemblages. In this study I compare the carabid beetle assemblages of a variety of meadow habitats in urban, suburban and rural locations. My results show that rocky dry meadows and managed dry meadows are the favoured habitat for many dry meadow species and many such species favour urban habitats, presumably due to the availability of dry, light and warm microclimate. Less xerophilic species were generally more abundant in matrix habitats and more rural areas.

BIAS IN ANALYSES RESULTING FROM SEASONAL DISPROPORTION WITHIN LIFE FORMS

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A lot of currently published vegetation studies use large phytosociological databases comprised of thousands of relevés. One of potentially important factors, which may play a hidden role in vegetation classification and analyses, is a seasonal variability of sampled vegetation. It is a well known fact that the time of sampling within growing season partly determines floristic composition, particularly in temperate zone. Therefore, the analyses based on relevés from one part of growing season might be completely unique. For example, various geophyte or therophyte species might be recorded only during particular phases of the growing season. We sampled data set of 46 permanent plots of dry grasslands, which were repeatedly recorded in three distinct periods of growing season (together 138 records). This data set was used, for assessment of seasonally-dependent proportions of different life forms. Our results were then applied on another dry grassland data set prepared by standard way (seasonally non-stratified sample) from Czech national phytosociological database. The main aim of our study was to predict number of species of various life forms, which would absent in such seasonally non-stratified large data set. Our analyses revealed that the most problematic group of species was therophytes, these showed highest disproportions in their occurrence.

PRELIMINARY SYNTAXONOMICAL SURVEYS OF CLASS *Festuco-Brometea* IN INGUL VALLEY (UKRAINE)

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The current condition of the steppes of Ukraine is a critically poor. The main cause of this is total plowing of steppe areas and unrestricted grazing. River valley slopes are several of few surviving sites of steppe vegetation. In particular, such refuge is located in the valley of the river Ingul, which is situated in the steppe zone of Ukraine. The Cl. *Festuco-Brometea* is characterized by the greatest diversity. Its communities are prevalent on the slopes of valley and transversal gullies of different exposure, and also unspoilt flat areas. According to preliminary estimates, in Ingul valley this class is represented by 9 associations that belong to 4 alliances and 1 order:

Class *FESTUCO-BROMETEA* Br.-Bl. et Tx. ex Soy 1947
- Order *Festucetalia valesiacae* Br.-Bl. et Tx. ex Br.-Bl. 1949
  - Alliance *Fragario viridis-Trifolion montani* Korotchenko et Didukh 1997
    - Ass. *Stipetum pennatae* R. Jovanovic 1956
  - Alliance *Astragalo-Stipion* Knapp 1944
    - Ass. *Astragalo austriaci-Salvietum nutantis* Korotchenko et Didukh 1997
    - Ass. *Stipetum lessingianae* Soó 1948
  - Alliance *Festucion valesiacae* Klika 1931
    - Ass. *Botriochloetum ischaemii* (Krist. 1937) I. Pop 1977
    - Ass. *Festuco valesiacae-Stipetum capillatae* Sillinger 1930
    - Ass. *Salvio nemorasae-Festucetum valesiacae* Korotchenko et Didukh 1997
    - Ass. *Festucetum valesiacae* Solodkova et al., 1986; Tkachenko et al., 1987
  - Alliance *Artemisio-Kochion prostratae* Soy 1964
    - Ass. *Agropyro pectinato-Kochietum prostratae* Zolyomi 1958 corr. Soy 1959
    - Ass. *Artemisio austriacae-Poetum bulbosae* Pop 1970

The composition of communities of Cl. *Festuco-Brometea* includes a number of rare and endemic species. Among them more than 20 species are included into the Red Data Book of Ukraine, about 20 species are comprised in the regional red lists. Further study of steppe vegetation in the Ingul valley will determine the dynamic changes of communities that is quite important in maintaining of valuable steppe areas.

SYNTAXONOMICAL REVISION OF THE PANNONIAN DRY GRASSLANDS IN AUSTRIA

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The Austrian part of the Pannonian lowlands cover 9.500 kmI which is 11.3% of the territory of Austria. Therefore, the Pannonian landscape is the second largest biogeographical region of Austria after the Alps which cover >60% of the country. Mean annual temperature ranges from 10 to 8 °C, and the mean annual precipitation ranges from 550 to 800 mm. Geologically, the region is very diverse. Calcareous and siliceous rocks, gravel, loess and sandy substrates result in a great variety of grassland types. The steep climatic gradient between the Alps and the Pannonian plain further increases the diversity within the region.
On the basis of a large data set (ca. 3000 relevés) which covered all kinds of grasslands, a syntaxonomical revision of the dry and semi-dry grasslands of Eastern Austria was conducted. Unmodified TWINSPAN and DCA were used to analyze the floristic patterns. Diagnostic species were calculated using various fidelity measures. The main focus of the study was on the association level. However, the delimitation of alliances, orders and classes is discussed as well. The results are compared with recent grassland studies from neighboring countries.

SOIL CHARACTERISTICS OF CALCAREOUS XEROTHERMIC GRASSLANDS IN THE LOWER ODRA RIVER VALLEY (NW POLAND) – PRELIMINARY RESULTS

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Specific soil characteristics on the calcareous xerothermic grasslands (e.g. high pH, presence of CO3) are crucial for the habitat maintenance in longer time perspectives and ensure suitable conditions for many rare species. In 2008-2010 we addressed spatial variability of soil chemical characteristics in the grasslands in Lower Odra region in NW Poland. We collected data for 38 grasslands (separate patches) differing in size. For each patch we collected several samples (from 6 to 29 per patch) along the linear transect, with one transect per patch. The transect started in the highest point of the grassland and run down to the lowest point, sampling stations were distributed every second meter of the transect. In total 433 samples were collected and for each sample we assessed pH H2O, pH KCl, %C, %N, proportion C to N and CO3. We investigated variability of the characteristics with generalized additive mixed models (GAMM) implemented in R. The chemical soil characteristics showed significant variability along transects, and the variability was both linear and nonlinear, depending on size of the grassland and studied characteristic. Moreover, significant differences in the studied characteristics were recorded between large and small grassland patches. The preliminary results show that chemical characteristics of the soil changes distinctly between patches as well as within a given patch and this variability could play an important role in driving spatial distribution of particular plant species. Interpretation of the obtained patterns in the context of grasslands conservation remains issue for further research and analyses.

CALCAREOUS DRY GRASSLAND VEGETATION OF NORTH-WESTERN RUSSIA

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Nordic calcareous grasslands are among most valuable and interesting nature habitats of Europe. They have high biodiversity and place a lot of rare species. Calcareous dry meadows are widely known from Sweden and Estonia. Besides some isolated patches are known from neighboring countries e.g. from Russian North-West.

Grasslands occupy insignificant areas in North-Western Russia. Calcareous grassland are especially rare still they occur only in geologically separated outcrops of limestone and dolomite mainly in current valleys or former fluvioglacial valleys and ravines. This investigation was carried out in 2005-2009 in three separated plots: Izborsk valley near Pskov, Izhora Ordovician plateau in Leningrad oblast and Hiisjдrvi-Kolatselga area in South-Western Karelia. All three areas are notable and characterized as valuable for regional biodiversity.

At the same time conservation of these grasslands is complicated by several reasons. Basic problem is caused by fragmentation of grassland patches increasing with time. As it was shown fragmented habitats are less favorable for threatened species conservation to compare with not fragmented ones. Comparison of communities observed with alvars of Sweden and Estonia confirms that conclusion.

The second problem is related with legal causes. Russian environmental laws do not provide effective management for grassland preservation i.e. necessary grazing and hay mowing.

The third problem is of economical nature. The organization of proper management for protected grasslands is complicated due to decreasing agricultural activities all across the Northern Europe.

Excursion guides

NATIONAL NATURAL PARK "BUZ'KY GARD"
The Cossaks' Land

Galina Drabinyuk

Southern Bug River valley near Yuzhnoukrainsk town

In the past, the Buh River was called Boh. That is, probably, why the rocks of the National nature park "Buzky Gard" resemble guards. The giants stand guard keeping watch and rule over the national shrines.

This territory is one of the most ancient parts of the land of Eurasia, which has not been covered by the sea for 60 million years! The National nature park "Buzky Gard" is a remnant of a branch of once massive mountains (similar to the modern Himalayas) that crossed the territory of modern Ukraine for more than 1000 kilometers from the northwest to northeast (from the Slovechansk-Ovruch Ridge to sub-Azov elevation). Cutting through the southern branch of the ancient mountains (the Ukrainian shield), The Southern Buh River runs along a nearly 40 kilometer long valley with steep rocky banks, some of which are 40-60 meters high. The natural environment of the National nature park "Buzky Gard" is unique and inimitable. The Southern Buh is perhaps the only river in Europe which has kept

the character of its rapids. One can still see here 12 roaring rapids scintillating with splashes. In the past, they were called *broyakas.* In this zone of the Ukrainian petrophyte steppe, deep ravines amidst the steep granite rocks of the canyon are still overgrown with gully forests,waving feather grass and flourishing rock lilies.

The national nature park "Buzky Gard" (7394ha) is situated at the border of the Podillia and sub-Dnieper eminences. The Southern Buh actually is this border. The park covers the river valley from the villages of Myhiya to Oleksandrivka as well as the canyon-like tributaries. The territory is extremaly rich in archeological layers: Paleolith, Mesolith, Neolith, Brazen age, Iron age, Bronze age, Cherniakhivska and Trypillia cultures; traces of settlements of Cimmerians, Sarmatians, Scythians, Olviopolits, ancient Slavs, and Romans. All in all, ninety eight archeological monuments have been discovered in the valley. The fisheries of Southern Buh once equaled those of the Dnieper River. According to the documents of the Zaporizhzhia Archives, fish, mostly of valuable breeds,were caught here is very large numbers. Archeological excavations also confirm that remnants of fishing dams, which were made of large stones, rock fragments etc, can still be found in some places here.

The patriarch of steppe forestry, hero of the war of 1812, son of the headman of the Buh Cossack troops, Lord Victor Skarzhynskyi was the first to estimate the unique natural complex of National nature park "Buzky Gard" at is true worth. He prohibited traditional economic activity in the Southern Buh valley, thereby preserving the natural steppe sections and oak-forests growing on cliffs. V. Skarzhynskyi eastablished a pomological garden (221 breeds), an arboretum (281 species), and planted a forest with a total area of 500 dessiatinas, or 1350 acres. The forest nurseries, founded by V. Skarzhynskyi, were used to provide plants for green areas in Odessa, Voznesensk, Mykolayiv, Alushta, Alupka, Pyatyhorsk, the botanical gardens of Odessa and Nikita, and Sofiyivka arboretum in Uman. The park's territory is closely connected with the history of the Zaporozhian Cossack Host. In the island near the confluence of Tashlyk and Buh rivers, the administrative center of Buh-Gard Palanka, the largest of the eight territorial units of the Cossack Republic, was located. The natural (and also historical) tract, Buh Grad, in the territory of the park, is a monument of historic landscape of the lands of the Zaporozhiam Sich Host. The Buh Gard tract has remained intact, as in the time of the Zaporozhian Cossacks.

The following historic toponyms are a vivid testimony of the glorious Cossack past: Protich tract and Protichanska Cliff, Zaporozka Broyaka, Turkish Table cliffs, Brama, Sova, Puhach, Haydamatska Balka, and the Island of Cossack Mamay. After the Russian troops destroyed the Zaporozhian Sich of June 4-5th, 1775, part of the Cossack army moved to the area of Buh rapids, where they held out for another two decades. Thus, the center of Ukrainian statehood existed in the territori of National nature park "Buzky Gard" untill the end of the 18th century.

This area, especially, the village of Myhiya, was one of the centers of the Haydamaky movement. Good military training, unreserved support from the population, excellent knowledge of the terrain and proximity to the border with the Ottoman Empire of that time made Haydamaks dangerous even for large divisions. One of the popular leaders, Andriy Mamay, become a legend and,later, a favourite heroic character in Ukrainian folklore. It is interesting to note that even some local person are a product of people's imagination.

However, actual facts make one wonder. According to the register of the Church parish of Mihiya, even as late as in the end of the 19th century, several families remembered well their famous relative. The surname Mamayenko vanished from Myhiya after Stalin's genocide of 1933.

According to the Law of Ukraine on the All-National Programme for National Environmantal Network of Ukraine in 2000-2015, it is planned to eastablish a number of national parks in Azov-Black Sea region,including a park of the National nature park "Buzky Gard" on the basis of the existing regional landscape park. Granting new status to the park is timely, for its treasures are definitely of national significance. The local flora includes over 1000 soecies of vascular plants, of which 28 appear on the lists of the Red Book of Ukraine and four on the European Red list. Thirteen plant groups are included in the Green Book of Ukraine. In addition to the steppe, meadow, forest and cliff species, many sub-Buh and sub-Black Sea endemics are found here as well as relicts of various geological eras.

Ravines with superficial bedding of crystalline rocks on the horizontal, cliffed terraces of the upper layers of the Southern Buh valley are dominated by unique, stony steppes. On the lower layer of the canyon, the beds and slopes of the ravines are covered with multicoloured oak-forests. The ordinary oaks of these peculiar forests, which are probably unique in the world, sometimes assume dwarf forms. This diversity concentrated within the area of just 7000 ha would add to the credit even of some Mediterranean areas. According to the results of bio-geographic analysis, a considerable number of species of plants and animals of he Mediterranean and Alpine origin are found here. Some plants of the National nature park "Buzky Gard" are found nowhere else in the world. Of these are the legendary Buh sandwort, which is little known to experts and whose tender dark-green pustules with star-shaped white flowers cling to vertical cliffs in unapproachable sections of canyons, Buh campion with its delicate crimson flowers and Bug pink.

As the surrounding lands were ploughed up, the valley of the Southern Buh became the last shelter of numerous representatives of fauna, approximately, 300 species of vertebrates of which forty six are protected by the state. These are danube shemaya, Large whip snake, Booted eagle, River otter, Badger etc. The local population of the wood snake is the only one left in the steppe regions of Europe.

In the late 1920s, the well-known geographer, H.Tanfiliev raised the question of the need to turn the Southern Buh canyon into a reserve. He believed that the riches of these lands should remain intact forever and serve as an area for scientific research, excursions, and recreation.

In March 1994 in the canyon of the Southern Buh, the national nature park "Buzky Gard" with a total area of 2000 ha was established. In April 1995, its territory was expanded to 3000 ha, and additional 2000 ha were reserved for further enlargement of the park. In spite of the economic difficulties, the authorities of Mykolayiv region allocated funds from the budget to support the landscape park.

The national nature park "Buzky Gard" has a unique recreational and health-improvement potential. Considerable supplies of curative radon waters are concentrated here. The Buh rapids have been a tourist mecca for many years. The Protich gorge offers one of the best natural water slalom tracks in Europe. The vertical cliffs of the canyon are a

favourite place for rock-climbers. The local picturesque landscapes attract many lovers of hiking and horse tourism. The park's territory is an object of scientific research and a place of field practice of the leading educational institutions of Ukraine. The park has a game preserve subdivision in the adjacent territories. The park is easy to reach as it is situated near the Kyiv-Mykolayiv and Poltava-Kishinev highways. Hotels and recreation centers are available for the tourists.

The flora of the NNP includes more than 1000 plant species. 34 representatives of the native flora are included in the Red Data Book of Ukraine, 6 on the European Red List, 5 on the IUCN Red List, 2 in Annex I of the Bern Convention. 11 syntaxa are included to Green Book of Ukraine.

The flora of the National Park has features of granite endemism with typical representatives of the Buh endemics: *Silene hypanica, Dianthus hypanicus, Cerasus klokovii, Sedum borissovae, Seseli pallasii, Moehringia hypanica, Onosma graniticola* etc. In the floristic composition were picked out a number of pre-pleistocene relicts: *Thalictrum foetidum, Stachys angustifolia, Thlaspi praecox*.

Western Black Sea and Black Sea endemics are also present: *Astragalus odessana, Centaurea besseriana, Rosa ucrainica* etc.

At the slopes of river valleys and gullies with not too deep bedding of crystalline rocks and on the horizontal terraces, the stone-steppe or rock-steppe vegetation prevails with communities of *Festuca valesiaca, Stipa graniticola, Phleum phleodes, Bothriochloa ischaemum, Thymus dimorphus, Artemisia marschaliana*, and in the south part of the park there are communities of *Stachys angustifolia*. In spring an important role is played by ephemeral and ephemeroid species. The most widespread of theseare *Erophila verna, Gagea szovitsii, G. bulbifera, Hyacinthella leucophaea, Tulipa hypanica*. Exactly in such phytocoenotic conditions grow narrow-local endemic species such as *Silene hypanica*.

The granite shields and rock cornices are mainly occupied by *Sempervivum* communities. In the cracks and hollows of crystalline rocks, filled by pit-run fines are settled *Aurinia saxatilis, Moehringia hypanica, Dianthus hypanicus, Rumex fascilobus, Allium podolicum, Seseli pallasi, Centaurea besseriana, Solidago virgaurea*, seldom *Achillea leptophylla,* and under more wet and shady conditions *Asplenium septentrionale, A. trichomanes, Cystopteris fragilis, Polypodium vulgare, Sedum borissovae* etc.

Under the pass to watershed area and on the gentle slopes of the river valley with quite thick soil layer at the wide area of the park remain the fragments of motley-grass-steppe and shrub-steppe. They are represented by endangered communities of different species of feather-grass (*Stipeta capilatae, Stipeta dasyphyllae, Stipeta pennatae, Stipeta lessinginae, Stipeta ucrainicae, Stipeta grafianae*), also by communities of fescue (*Festuceta valesiacae*). Among shrubby-steppe communities the coenoses of *Spiraea crenata, Caragana frutex* and *Amygdaleta nanae* prevail.

In the valley of Southern Buh River and its tributaries there are rich and diverse faunistic complexes. Due to all-round ploughing-up of adjacent areas the canyon is the last refuge for many species of animals. The situation of the area at the border of two geographic zones – Forest-Steppe and Steppe, the meridional direction of the river caused

the penetration to the area the forest-steppe, boreal and even mountain-alpine animal species from north and Mediterranean, Pontic and steppe species from south.

Actually, the area of the park is inhabited by 22 species of vertebrates, which are included in Red Data Book of Ukraine, 5 on the European Red List, 5 on the IUCN Red List, and 176 species are protected by Bern Convention. The representatives of rare fauna are *Elaphe longissima, Lutra lutra, Barbus barbus borysthenicus, Hieraaetus pennatus, Aquila pomarina, Lacerta viridis* etc*.* According to expert estimates, the number of invertebrates reaches more than 11,000 species. Among them revealed 23 species from the Red Data Book of Ukraine, 10 from the European Red List, 4 from the IUCN Red List, and 7 from Annexes of Bern Convention. Rare species are *Anax imperator, Saga pedo, Calosoma sycophanta, Zerynthia polyxena, Bombus argillaceus.*

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KURGANS AS REFUGIA OF THE STEPPE FLORA AND VEGETATION IN UKRAINE
(AN EXAMPLE OF "MEZHOVYI" KURGAN NEAR KURIPCHINO, PERVOMAISK DISTRICT, MYKOLAIV REGION)

Ivan Moysiyenko & Barbara Sudnik-Wojcikowska

Kurgans, known also as barrows, are found throughout greater part of Europe. They vary in size and origin. Nowhere else in Europe do they occur in such great number as in Ukraine. Originally, there were some 500,000 kurgans in Ukraine. Today, however, only 100,000 (50-150,000) kurgans remain. They are, therefore, a characteristic and unique element of the Ukrainian landscape.

Most of the kurgans located in the south of Ukraine are of Scythian and Sarmatian origin. Barrows were also constructed by Cimmerians, Huns, Bulgarians, Magyars, Nogays, Polovtsians, and others. The oldest kurgans were built over 5000 years ago and the most recent ones are over 700 years old.

In the past kurgans served as landmarks points in the monotonous landscape of the steppe. At present about 80-95% of the steppe area in Ukraine has been converted into arable land. Kurgans pose a serious problem to large-scale agriculture. As a result, many of the barrows have been lowered or completely destroyed.

The approach to the problem of kurgans has changed recently (e.g. Rowińska et al. 2010). Both archaeologists and historians as well as botanists, who are supported by nongovernment organizations, point out that kurgans should be protected by law. The aim of our study was to provide some strong additional arguments for the protection of the barrows.

Our seven-year floristic study of the kurgans in three steppe zones and in the forest steppe zone confirm the important role barrows could play as refugia of valuable steppe species.

Among the 29 kurgans investigated in the Pontic rich herb grass steppe zone (Moysiyenko, Sudnik-Wyjcikowska 2009), four barrows supported over 160 species, e.g. kurgan R18 in the Pervomaisk District, Mykolaiv Region). The criteria that determined the choice of the above kurgan were high floristic richness and easy access to the barrow (which was located close to an asphalt road), as well as the close vicinity of the National Nature Park 'Buzsky Gard', which we will visit during our field trip.

Kurgan R18 ($31^0$03'24.3", $48^0$01'04.9") is one of the biggest barrows in the area. It is 8 m high and 80 m in diameter. The kurgan is situated 3 km south-east of the village of Kuripczino, between the villages of Blagodatne (Arbuzinka Distrct) and Mygiya (Pervomaisk District). A windbreak separates the kurgan from the road Kijyw-Mykolaiv to the north. The presence of the windbreak in the immediate vicinity of the kurgan has an impact on tree overgrowth on the north-facing slope of the barrow. This process is less strongly marked on the kurgans located in the open area. Due to the close vicinity of the road and cultivated fields the barrow is quite frequently visited and its plant cover has been locally disturbed.

Kurgan R18 was investigated in 2005-2006. The most important results, which were published in an earlier paper (Moysiyenko, Sudnik-Wyjcikowska 2009), are presented below (the species nomenclature follows Mosyakin & Fedoronchuk 1999).

The flora of the investigated kurgan comprised 165 vascular plant species (cf. - the kurgan which was the richest in species supported 171 taxa). The relatively high number of native species – 126 taxa (76.44%), of which 89 (54.0% of total flora) were steppe species, indicates that the vegetation cover on the kurgan is well-preserved. It should be noted that 6 sozophyte species were recorded on the kurgan, of which one – *Linaria biebersteinii* is included in the IUCN Red List, and two species – *Adonis vernalis* and *Stipa capillata* – in the Red Data Book of Ukraine (2009). The remaining taxa are listed in the regional red books, e.g. *Amygdalus nana, Iris halophyla, Limonium platyphyllum.*

We identified 5 microhabitats within the investigated kurgan. The highest number of species was recorded at the northern foot of the barrow (105 species). Shrubs occupied a considerable area here, and were represented mainly by *Amygdalus nana* and *Prunus stepposa*. *Craetegus sp*. and *Sambucus nigra* were found alongside these species. The trees were represented mostly by introduced species, most of which had spread outside the windbreaks, e.g. *Acer negundo, Fraxinus pennsylvanica*. Shade-tolerant species occurred under the canopy of trees, e.g. *Ballota nigra, Galium aparine, Geum urbanum*. The remaining part of the foot is covered with vegetation similar to meadow vegetation. The following species occurred with greater abundance: *Bromopsis inermis, Carex praecox, Coronilla varia, Elytrigia repens, Galium verum, Phlomis tuberosa* i *Poa angustifolia*. The upper part of the foot has preserved a steppe-meadow character. A total of 85 species were recorded at the southern foot of the kurgan. Shrubs covered a much smaller surface area here. *Amygdalus nana* was relatively abundant. Single specimens of such species as *Armenica vulgaris, Malus domestica* and *Sambucus nigra* were noted. The southern foot, which borders the cultivated fields, is highly disturbed. The species that occurred in the

greatest abundance were: *Agropyron pectinatum, Cardaria draba, Carduus acanthoides, Elytrigia repens, Galium verum* i *Poa angustifolia*. Particularly interesting species were found much more rarely and included: *Campanula bononiensis, Centaurea adpressa, Echinops sphaerocephalus, Elisanthe viscosa, Elytrigia trichophora, Euphorbia stepposa, Fragaria viridis, Gagea erubescens, Lavatera thuringiaca, Ornithogalum kochii, Ranunculus polyanthemus, Senecio erucifolius, Taraxacum serotinum, Thalictrum minus, Vicia tenuifolia, Viola hirta* and others.

The south-facing slope of the kurgan was richer in species (77 species, taxa) than the north-facing slope (64). The south slope represents a dry steppe habitat. Two species of sod grasses: *Agropyron pectinatum* and *Stipa capillata*, which represent the dominant life forms characteristic of the true steppe occurred in the greatest abundance. The north-facing slope has a slightly higher moisture content. A number of rhizomous plants grew abundantly here, e.g. *Artemisia austriaca, Carex praecox, Festuca valesiaca, Galium verum, Poa angustifolia*. Compared to the other types of microhabitats within the kurgan, the north-facing slope contained the highest number of steppe species. Particularly noteworthy were: *Allium paniculatum, Astragalus asper, Dianthus guttatus, D. membranaceus, Gagea pusilla, Goniolimon tataricum, Hylotelephium polinicum, Iris pumila, Kochia prostrata, Koeleria cristata, Linaria genistifolia, Oxytropis pilosa, Ranunculus scythicus, Verbascum austriacum, V. phoenicaeum, Veronica austriaca, Veronica spuria*. There was also a group of steppe species which were not exclusively associated with the slopes and were distributed evenly within the kurgan, e.g. *Achillea pannonica, Achillea stepposa, Melica transsilvanica, Pastinaca clusii, Peucedanum alsaticum, Phlomis pungens, Seseli tortuosum, Stachys recta, V. spicata* ssp*. barrelieri.*

The top of the kurgan supported the lowest number of species. Only one species, i.e. *Agropyron pectinatum* (hemiapophyte, originally from steppe habitats) was found growing abundantly here. The absence of the most valuable characteristic steppe species was noted. Species such as: *Achillea nobilis, Artemisia austriaca, Campanula bononiensis, Falcaria vulgaris, Hylotelephium polonicum* were also recorded in the other microhabitats within the kurgan. The top of the barrow is highly disturbed. Recently, a wooden cross has been erected here – an object of worship, which is a characteristic landmark on the border of the Pervomaisk District.

The entire surface of the kurgan has been more or less disturbed. As a result, there is a considerable number of synanthropic species found on the barrows, e.g.: *Amaranthus retroflexus, Ambrosia artemisiifolia, Chenopodium album, Glechoma hederacea, Grindelia squarrosa, Medicago falcata, Melandrium album, Taraxacum officinale.* Among the 104 synanthropes recorded on the kurgan, 39 were anthropophytes and 39 were hemiapophytes. The latter group of species also occurs in habitats which have been only slightly transformed by man, e.g near animal burrows an dens on the kurgans. Kurgans are recognized as 'habitat islands' in the contemporary anthropogenic landscape. The variety of microhabitats found within the barrows are characterized by a specific flora. This may hold true also for animals.

NATIONAL NATURAL PARK "OLESHKIVSKI PISKY"

Alexandr Khodosovtsev, Ivan Moysienko & Brian Kuns

Very hilly dunes with pioneer psammophytic vegetation.

The national park "Oleshkivski pisky" was created in 2010. The park covers more than 8020.36 ha and is situated along the Lower Dnipro. In total, there are seven somewhat separate sandy areas (arenas) with significant sand dunes, but the park is located mainly in two of these arenas: the Kozachelagerska (Kozachelagerska location) arena and Chalbaska (Burkutska location) arena. The landscape is dominated by sandy steppe and dunes, but spread out are depressions with meadows, halophytic vegetation, wetlands, and groves of birch, aspen, oak, and rare alder (Ukrainian name "*gaiky*"). Typical and rare vegetation are preserved here, with endemic and relict species of high plants, fungi, lichens and animals, which are included in the Red Book of Ukraine, the European Red List, the Red List of IUCN and the Red List of Kherson region.

Relief. 4 types of geomorphological locations are presented with respect to the character of absolute elevation and level of meso relief division (Ходосовцев та ін., 2009).

Type 1. Very hilly dunes are situated on the western and southern sectors of both massifs. This type is characterized by considerable relative height differences (10-15 m) with deep relief division. Strong erosion processes prevail.

Type 2. Moderately hilly dunes occupy large areas in the central and southeastern parts of both locations. This type is characterized by considerable absolute heights but insignificant relative height differences.

Type 3. Low hilly sands occupy the northeastern and northern parts of the Kozachelagerska location and the east-central, eastern and northern parts of the Burkuts`ka location. Absolute elevation is lower and relative height differences are insignificant.

Type 4 consists of flatlands, which occupy the northern and north-central parts of both locations. There is almost no relief with the very insignificant differences in relative height. Small lakes are formed here due to low ground water depth. In the Burkutska location, the lakes have an area of 10 ha.

Climate. The average annual air temperature in the dunes is +9,8°C. July and August are the hottest months of the year. Average temperature in July is +22.7°C. Maximum air temperature in August reaches +40°C. The temperature of open sand on a clear windless day in May reaches +40°C, in June-July up to +60°C, and in the middle of September +44°C. The average air temperature stays below zero for roughly four months (November-March). Minimum average temperature in January is -6.2°C, and the lowest recorded temperature, -33°C, occurred in the month of February. The vegetative period lasts 184-230 days. Average precipitation on the Lower Dnipro sand arenas is 368 mm per year (Гордиенко, 1969).

Flora. Approximately 500 species of vascular plants grow in the "Oleshkivski pisky" national park. Rare species constitute an important part of the flora. 30 species are included in different conservation plant lists. 108 endemic and subendemic taxa are counted in the flora of the Lower Dnipro sand arenas (Уманеö, 1997), including: *Centaurea breviceps* Iljin., *Jurinea laxa* Fish., *Thymus borysthenicus* Klokov, *Alyssum savranicum* Andrz., *Crataegus alutacea* Klokov, *Agropyron dasyanthum* Ledeb., *Goniolimon graminifolium* (Ait) Boiss ets.

Vegetation. The prodromus of vegetation in the Lower Dnipro arenas includes 9 classes, 11 orders, 13 unions and 25 associations (Карнатовская, 2006). Large areas in the "Oleshkivski pisky" national park are covered by communities of *Festucetea vaginatae* and *Salicetea purpureae*.

Psammophytic steppe. The psammophitic steppes occupy very stabile areas of the arenas where erosion processes are not active. Usually these are low hilly dunes, and some moderate hilly dunes and psammophitic steppe is absent on very hilly dunes. The following species prevail in the sandy steppes: *Agropyron lavrenkoanum* Prokud., *Festuca beckeri* (Hack.) Trautv., *Stipa borysthenica* Klokov ex Prokudin, *Koeleria sabuletorum* (Domin) Klokov. Other species, such as *Agropyron pectinatum*, *Stipa capillata, Euphorbia sequierana* Neck. are characteristic both for sandy steppes and true steppes. In general in the psammophitic steppe, the more common plants that are encountered are as follows: *Carex colchica* J.Gay., *Alyssum savranicum*, *Dianthus platyodon* Klokov, *Helichrysum corymbiforme* Opperman ex Katina, *Scabiosa ucrainica* L., *Centaurea breviceps*, *Tragopogon borysthenicus* Artemcz., *Senecio borysthenicus* (DC.) Andrz. ex Czern., *Jurinea laxa*, etc... The small semi-shrubs *Artemisia marschalliana* Spreng and endemic *Thymus boristhenicus* figure

prominently in the sandy steppe vegetation cover. In spring, numerous ephemeroids grow on open sand, free from shrubs and perennial high plants. Examples are: *Alyssum minutum* Schlecht. ex DC., *Cerastium bulgaricum* Uechtr., *Holosteum umbellatum* L., *Erophylla verna* (L.) Besser, *Milium vernale* M.Bieb., *Macrosepalum aetnense* (Tineo) Palanov, *Poa bulbosa* L., *Spergula morisonii* Boreau, *Veronica dillenii* Crantz. In general, one can say that the very low humus content of the sand/soil, plus other natural and historical conditions have resulted in a vegetative cover that is specific and typical for sands only.

The mesophytic variant of psamophytic steppes is formed in dry depressions and on slopes that face towards the north. The following gramineous plants prevail: *Festuca beckeri* and *Agropyron lavrenkoanum Calamagrostis epigeos, Carex colchica,* and, among dicotyledonous plants *Inula sabuletorum* Chern. ex Lavrenko and *Achillea euxina* Klokov dominate. Among shrubs *Genistha sibirica* L. and *Salix rosmarinifolia* L. also figure prominently.

In contrast with the true steppe, lichen and moss communities are more evident on dunes in the psammophitic steppe that are free from high plants. Their coverage exceeds the coverage of vascular plants on most of the territory of the psammophitic steppe. The most abundant mosses and lichens are: *Tortula ruraliformis*, *Ceratodon purpureus*, *Cladonia foliacea*, C*ladonia rangiformis*, *Cetraria steppae*, *Xanthoparmelia pockornii*. The lichens *Placynthiella uliginosa* are pioneer on open sand substrates.

Open sand dunes are occupied by pioneer high plants. These are *Agropyron dasyanthum* with long roots and *Chamaecytisus borysthenicus* with long rhizomes. *Corynephorus canescens* was added to the psammophythic flora in the `Oleschkivski pisky` national park. It has been actively used from middle of the 20th century to prevent further deflation of the open dunes, i.e. to prevent the sand dunes from growing. Though pine trees earlier did not naturally grow in the Lower Dnipro sands, pine trees have also been widely planted to prevent erosion, and today they actually occupy a large part of the sands.

The psammophythic steppe vegetation has been destroyed as a result of overgrazing and then afforestation on a large part of the territory of Burkutska location of the `Oleschkivski pisky` national park. The main preserved areas of steppe vegetation can be found in the central (Lypaiky and Lagerske) and northern parts (Rakiv Kutochok, Kornikove, Grushove) of the Kozachelagerska location. Original steppe vegetation in the Burkutska location can be found around the village Burkuty.

Meadow vegetation. Meadow vegetation is widespread mainly in large depressions or on small deep declines on sand dunes. The vegetation cover of meadows strongly varies depending on the degree of water present. Meadow vegetation includes: *Agrostis gigantea* Roth, *Agrostis sabulicola* Klokov, *Calamagrostis epigeios*, Carex distans L., *Cynodon dactylon* (L.) Pers., *Elytrigia obtusiflora* (DC.) Tzvelev, *Festuca rupicola* Heuff, *Schenodorus interuptus* (Desf.) Tzvelev, *Scirpoides holoschoenus* (L.) Sojak, *Verbascum phoeniceum* L., *Hypericum perforatum* L., *Daucus carota* L., *Tanacetum vulgare* L., *Erigeron podolicus* Besser. More waterlogged areas are covered by *Carex acuta* L., *Carex riparia* Curt., *Phragmites australis* (Cav.) Trin. ex Steud*., Symphytum officinale* L., *Lythrum salicaria*, *Eupatorium cannabinum* L., *Epilobium hirsutum* L.

Forest vegetation. The birch groves (gaiky) contain the endemic species *Betula borysthenica* Klokov, which is included in the Red Data Book of Ukraine. It grows in depressions, among open sand dunes, or on psammophytic steppes. The birch forest can be pure or mixed with *Populus tremula* L.*, Pyrus communis* L., often together with meadow, bog and/or halophytic vegetation. Boreal species are more present at the Burkutska location. Here one finds *Lycopodiella inundata* (L.) Holub and three species of *Sphagnum* mosses: *S. fallax*, *S. squarrosum*, *S. fimbriatum*.

Oak trees are characteristic only for the Burkutska location. They can be found in small hyperxerothermic groves (gaiky) together with a meadow, bog and wetland vegetation. Associated species are *Betula borysthenica*, *Populus tremula*, *Pyrus communis, Alnus glutinosa*. The pure aspen, alder and ash gaiky are rare on the territory of the "Oleshkivski pisky" national nature park.

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BIOSPHERE RESERVE "ASKANIA-NOVA"

Viktor Shapoval

Askanian steppe with Scythian stone image

History of the Reserve establishment. In 1883 the pioneer of conservation of the original nature of the Black-Sea region steppe of Tavria – Baron Fredrick Eduard Falz-Fein picked out 8 dessiatinas of steppe and introduced marmots into them. It was the first attempt at wild steppe protection in the world. Dissatisfied by the results, in 1888 he removed 1000 dessiatinas of virgin land from use. The vegetation rehabilitated badly because new area was situated near the "Kroli" area where the wide tchoomak road passes through. Finally, Baron Fredrick clarified with protected steppe when he used landscape approach. This fragment of virgin steppe remains and is the well-known "Stara" plot with a total area of 520 hectares.

After the Great October Socialist Revolution the destiny of patrimony "Askania-Nova" and protected areas was determined by two decrees of 1919 and 1921 in accordance with which all property was nationalized and the State Steppe Reserve of the Ukrainian Socialist Soviet Republic was established. Stationary investigations at that time were carried out by several departments of the Scientific Steppe Station (1921-1930), which after reorganization in 1930-1932 changed to the All-union Scientific-Research Institute of Hybridization and Acclimatization of Animals. But from the autumn 1933 these investigations were discontinued because in accordance with the conclusion of the

commission, the investigations “don’t have a practical importance” and scientists themselves turned into “public enemies”.

When the Second World War finished as determinative for protected steppe became the Resolutions of the Council of Ministers of the USSR: in 1964 the virgin steppe in Askania-Nova was proclaimed as the State Reserve of the UkrSSR, in 1965 the ploughed areas were joined to the Reserve and its area reached 11054 hectares. In October 1983 by decision of the Presidium of the Southern Department of the All-union Academy of Agricultural Sciences the State Reserve was turned out into Biosphere Reserve and at 15 February 1985 at the 8th Session of Bureau of the International Coordinating Council of UNEP program “Man and Biosphere” the Biosphere Reserve was included in the international network of biosphere reserves.

Structure. In accordance of the Law of Ukraine “About natural and protected assets of Ukraine” the Biosphere Reserve “Askania-Nova” determined as natural area and object of the natural and protected fund which has special nature-protected, scientific, aesthetic, recreational and other values and picked out for conservation of the natural diversity of landscapes, gene pool of animal and plant world, maintenance of total ecological balance and providing of the background material for environment monitoring.

According to the Regulation about Biosphere Reserve “Askania-Nova” it’s total area is 33307.6 hectares including protected zone (natural core) — 11054 hectares, buffer zone — 6896 hectares (with dendrological park — 167.3 hectares and zoo — 77.5 hectares) and anthropogenic landscapes zone — 15358 hectares.

In accordance of the Law of Ukraine “About natural and protected fund of Ukraine” were established differential regime of the protection, restoration and using of the natural complexes for the Biosphere Reserve “Askania-Nova” correspondingly to the functional zoning:

1. Protected zone includes areas intended for the conservation and restoration of the most valuable natural and slightly disturbed complexes (protected steppe), gene pool of the plant and animal world; it’s regime determined accordingly for requirements for natural reserves;
2. Buffer zone includes areas which are picked out for the purpose of prevention of the negative influence of the economic activity at the territory adjacent to the protected zone;
3. Zone of anthropogenic landscapes includes areas of the agricultural land-use, settlements and other types of economic activity.

Natural conditions. In accordance of physical and geographical zoning of Ukraine (1985) the region of the Biosphere Reserve “Askania-Nova” belongs to Prisivashsko-Priazovskyy lowland steppe situated in SE part of Khreson and SW part of Zaporizzhya regions. Askanian steppe represents SE Dnieper section of the Left-Bank plain district of the Danube-Don biogeographic province (Polischuk, Bahniuk, 1999). Accordingly to floristic zoning of Ukraine the region limited by the borders of Lower Dnieper historical-geographical floristic region which occupied the ancient deltas of the Dnieper and Pivdenny Bug rivers to the Molochnaya River (Dubovic et al., 1975) and belongs to Western Black Sea-Plain Crimean districts of the Western-Black Sea subprovince Black Sea-Don province of the

Pannonian-Black Sea-Caspian region (Zaverukha, 1985). According to botanical-geographical zoning the Askanian steppe pertain to Left-Bank Grass Steppe of the Grass Steppe subzone of the Steppe zone of Ukraine (Lavrenko, 1935) and Azov-Black Sea subprovince Black-Sea (Pontic) province of the Pontic-Kazakhstan subregion of the steppe region of Eurasia (Lavrenko, 1970). In format of the geobotanic zoning of Ukraine (Bilyk, 1973; Geobotanical zoning of Ukraine, 1977; Didukh, Shelyag-Sosonko, 2003) the area represents Askanian geobotanic district of the Chaplynsko-Yakymivsko-Azov geobotanic region of fescue-feather-grass steppe stripe.

Annual temperature in the region of Askanian steppe is +9.4°C. The range of the annual temperature is more than 70°C. Average temperature of July is +23.5°C, January –3.4°C. Absolute minimum of the air temperature is –30.9°C. Annual precipitation is about 400 mm with considerable range (180–690 mm). Prevailing winds are easterly. The relief is slight (19.7–33.0 м) with weak total slope (S, SW) and presence of unflowed depressions with different area, depth and shape. At the watersheds there are dark-chestnut residual saline soils (73,9%), gentle slopes represents by dark-chestnut saline soils (7,4%), depressions and microdepressions covered by meadow-chestnut soils (7.2%) and gley-solod (1.4%).

History of botanical research. Study of the modern Biosphere Reserve "Askania-Nova" natural complex started at the first half of 19th century by agronomist Franz Teezmann who served as steward in the colony of Duke Ferdinand Angalt-Ketten during 1832-1843. In his five works were presented the data about climate, soils, and vegetation of the patrimony. F. Teezmann collected herbarium from both Duke's plots (Askania-Nova and Dofino) and completed a first floristic list of the Askanian steppe (and partly adjacent territory) with relative number for each species. Unfortunately, publications of F. Teezmann were practically forgotten. In the translation of original F. Teezmann by Prof. Alexander Yanata "About South-Russian steppe and patrimony of Duke Ferdinand Angalt-Ketten situated in Tavria" published in Saint-Petersburg noted "Even for such diligent investigator of Askania-Nova flora as Y. Pachosky this work was known only by its name, but wasn't found and not used as original source for Askania-Nova flora and Near-Black Sea steppe. Other investigators of Askania didn't make it also. While F. Teezmann's work although old but considerable source…" Essence of his priority consists of original quantitative methods of the steppe plant cover investigations.

F. Teezmann's data about natural conditions of Askania-Nova region supplements by publications of P. Keppen and O. Sovetov. Generally, the works of 19th century outline the first stage of natural studies of Askanian steppe and its region before establishment of the Reserve.

After the final fixing of the protected steppe in nature by Baron F.E. Falz-Fein, the flora was actively investigate and a herbarium was prepared by S.A. Mokrzhetsky (1898), Y.K. Pachosky (1902-1923). O.S. Doych and A.A. Yanata (1913-1929), S.A. Dzevanovsky (1923-1932), M.S. Shalyt (1924-1930), N.O. Desiatova-Shostenko (1926-1930), N.T. Osadcha (1929-1932), N.T. Nechaeva (1929-1933), Z.T. Izvekova (1937-1941) etc.

From the beginning of 20th century reports appeared about the flora of the Tavrian province of O.S. Doych and A.A. Yanata "Steppe flora of Melitopol and south-west part of

Dneprovsky uyezds of Tavrian province" and "Additional list of the North of Tavrian province plants". On the base of results of systematic investigations of steppe flora and vegetation a series of Y.K. Pachosky works were published, namely a multiple-volume edition of the "Survey of Kherson province vegetation" which remains relevant even today as classic fundamental database about state of flora and vegetation of Black Sea Steppe at the end of 19th – beginning of 20th century.

Large-scale and complex investigation of nature starts after declaration of the State Steppe Reserve in Askania-Nova and organization of the Scientific Steppe Station. In short space of its existence (1921-1930) was carried out the inventory of the natural resources of the Reserve. Y.K. Pachosky (the head of botanic department in 1922-1923) and researcher Yu.D. Sukhova established stationary botanic study. In 1923 Y.K. Pachosky completed the first annotated list of flora of the State Reserve "Askania-Nova". In 1925, a complex investigation of the relief, soil cover and vegetation of the virgin steppe was carried out. In the series of geobotanic essays of the State Reserve "Chapli" in 1930's N.O. Desyatova-Shostenko and M.S. Shalyt elucidated the results of the virgin steppe mapping and showed the integral pattern of its state in territorial distribution.

For the first time the vegetation units were determined – associations and revealed its ecological peculiarities. Contemporary influence of grazing and burning on vegetation and processes of restoration of fallow lands were studied (M.S. Shalyt, L.I. Tiulina). Deep analysis of the protected area "Stara" vegetation was carried out by acad. V.M. Sukachov and G.N. Poplavskaya.

The complex investigation on phytobiota's inventory was completed by lichenological studies of A.M. Oxner (1924), floristic and goebotanic expeditions of M.V. Klokov (1921, 1927), M.I. Kotov (1927), Ye.M. Lavrenko (1927) etc.

In general, the period of the Steppe Station existence was the time of the most fruitful studies of the Askanian steppe nature. In the "Bulletin" of Reserve were published fundamental scientific works about climate, hydrology, soils, vegetation and fauna of the region.

In 1929 under the leadership of V.V. Strachinsky, prof. of Kharkov University, were organized ecological and biocenotical investigations. Unfortunately, after visiting of T.D. Lysenko and I.I. Present in "Askania-Nova" the scientific works was curtailed and scientists were considered as "public enemies".

Irreplaceable losses for the scientific work of the Reserve brought the period of the German occupation. The scientific archive, museum fund, library and herbarium were destroyed. Only some herbarium collections (duplicates) of Y.K. Pachosky, A.A. Yanata, S.A. Mokrzhetsky, S.O. Dzevanovsky, M.S. Shalyt, F.Ya. Levina, which remained in the Natural-Historic museum of the Tavrian province Zemstvo, were passed on to V.I. Vernadsky Tavrian National University. In the nominal collection of Y.K. Pachosky "Flora of Tavria" and "Khersonian Flora" which belong to I.I. Mechnikov Odessa National University collections from "Askania-Nova" there are only 62 herbarium sheets. 104 herbarium specimens of Y.K. Pachosky from the territory of Reserve are preserved in Kherson Museum of local lore.

After the Second World War the renewal of scientific investigations in Askania-Nova was initiated by V.L. Komarov Botanic Institute of the Academy of Sciences of USSR. In 1947

V.M. Ponyatovskaya organized stationary geobotanic and phenological observations, carried out the work on restoration of herbarium which later was adopt by M.A. Reschikov (1949-1950), Ye.I. Korotkova (1950-1953), I.O. Schipanova (1960-1964), V.G. Vodopianova (1966-1970, 1975-1980), Ye.P. Vedenkov (1966-1970, 1986-1987), A.M. Krasnova (1981), L.D. Yelonova (1987-1990), K.E. Golovaniova (1981-1985) etc.

The next floristic report on territory of "Askania-Nova" Reserve was prepared by Ye.I. Korotkova in 1964. She studied the dynamic and productivity of steppe phytocenoses, its avtogenic and allogenic changes, elaborated classification and mapping of vegetation. Under leadership of Ye.P. Vedenkov from 1965 the botanic studies in "Askania-Nova" Reserve received a permanent subject: phenology of vegetation on ecological profile (watershed – slope – depression), inventory of the natural core flora, periodical mapping of the virgin and fallow lands vegetation, monitoring of steppe restoration after grazing, ploughing, burning, hay-mowing, flooding, influence of protected regime, analysis of zonal and intrazonal phytocenoses productivity, ecological peculiarities of an endemic and rare plants etc. In 1970's was carried out the complex study of the restoration and dying off dynamic of the ground and underground plant mass, using of humus, soil water and the main elements which pass through cenoses due to irrigation (N.Yu. Drogobych, S.S. Zvegintsov, T.I. Ushachova).

Important results of an analysis of Askanian steppe vegetation restoration were reflected in works of G.I. Bilyk, V.V. Osychniuk, V.S. Tkachenko. A great contribution into wide subjects on zonal classification of life forms became biomorphological investigation of the Askanian flora by L.P. Vasilieva. The inventory of bryophyte flora of the Reserve was carried out by M.F. Bojko et al.

In the next period the staff scientists studied the structure and dynamic of biocenoses, developed the science-ground regime of the protected steppe conservation and rational use. In 1986-1990 was realized the next re-inventory of the high plants flora and mapping of the protected steppe (Ye.P. Vedenkov).

Present state of flora and vegetation. In accordance of analysis of previous floristic reports, current re-inventory observations of 2003-2010 and critical revision of herbarium collections the list of vascular plants of the protected core of Biosphere Reserve "Askania-Nova" includes 509 species.

Generally, the flora of the Askanian Steppe is unsuitable object for floristic research because the history of its stationary investigation reaches more than 170 years. There are several detailed floristic reports from the territory with actual area only 11054 hectares and the flora itself is naturally poor: "… the number of species growing in the territory of Askania-Nova are strikingly little", "First of all one is struck by the… astonishing poverty of Askanian Flora" (Pachosky, 1923, c. 97, 135). Thus, the vascular flora of the Askanian steppe, which belongs to the subzone of poorly-motley-grass fescue-feather-grass steppe of Ukraine, is "f presumably" poor, and after separation of its depression fraction (plants growing only in depressions and microdepressions) turn out simply meagre: this reduces the total list of the flora on j (all hydro- and hygrophytes, some mesophytes, xeromesophytes etc.). This problem became drastic taking into account abnormal high portion of the synanthropic elements. But the relative floristic "poverty" of the Askanian

Steppe is not a defect or shortcoming. This is the natural state and real criterion of phytodiversity of poorly-motley-grass variation of fescue-feather-grass steppe, not distorted by floristically saturated erosive slopes with different expositions with wash down soils and rock outcrops which jointly provide diversification of microclimate, ecological niches etc. with resulting quantitative changes of floristic composition. Therefore, "poorness" of Askanian watershed steppe is its original, virgin "richness".

General parameters of systematic structure of vascular flora of the protected core and positions of the 10 leading families spectrum are the following: *Asteraceae* — 82 species (16.1 %), *Poaceae* – 61 (12.0%), *Fabaceae* – 39 (7.7%), *Brassicaceae* – 32 (6.3%), *Lamiaceae* – 26 (5.1%), *Caryophyllaceae* and *Chenopodiaceae* – each are 24 (4.7%), *Cyperaceae* – 16 (3.1%), *Apiaceae* and *Veronicaceae* – each are 15 (2.9%). The first 10 families include 65.6% of the total flora. It's total number is 63 with 265 genera. Thus, systematic proportion of the actual composition of flora of the protected core realized as 1 : 4.2 : 8.1.

The systematic structure of the Askanian steppe flora corresponds to general features of Eurasian steppe province, with clear attributes of Mediterranean floras (high proportion of legumes, crucifers, Labiatae, carnations, umbrelliferous), from other side — boreal floras (predominantly Compositae, cereals, participation of sedges etc).

In phytocenoses of watershed steppe prevail xerophylous dense-turfy grasses: *Stipa ucrainica* P. Smirn., *S. lessingiana* Trin. & Rupr. and *S. capillata* L., *Festuca valesiaca* Gaudin, *Koeleria cristata* (L.) Pers. On slopes, the proportion of rhizomes of grasses and sedges increase: *Poa angustifolia* L., *Bromopsis inermis* (Leyss.) Holub, *Carex praecox* Schreb. In depressions large-grass meadow formations prevail with *Elytrigia pseudocaesia* (Pacz.) Prokud. and *Carex melanostachya* M. Bieb. ex Willd. on the flash floods — bog communities with *Butomus umbellatus* L., *Beckmannia eruciformis* (L.) Host, *Lythrum virgatum* L., *Gratiola officinalis* L., *Schoenoplectus lacustris* (L.) Palla.

Hence, heterogeneity of relief (presence of dry watershed areas and depressions with better moisture conditions) causes the phytocenotic diversity of steppe. Thus, territory of protected coreof the Biosphere Reserve "Askania-Nova" represents the zonal (watershed) and intrazonal (depressions) vegetation. Zonal vegetation presented by the genuine steppe, where the most important formations are *Festuceta valesiacae* (31%), *Stipeta ucrainicae* (32%) and *Stipeta capillatae* (10%). The rest area occupied by meadow steppe — 14%, meadow (genuine — 8%, steppe — more than 3%, bog — to 1%) and shrub steppe with edificators *Caragana scythica* (Kom.) Pojark. and *Amygdalus nana* L.

In the prevailing formation *Stipeta ucrainica, Stipa capillata* and *S. Lessingiana* are often encountered, but the role of *S. capillata* considerably increases on the slopes of Askanian steppe. Here it gradually adopts the dominant position of *S. ucrainica.* However, total area of the *S. capillata* formation is inferior to *Stipeta ucrainica* and reaches about 1000 hectares. The tendency of *Stipa capillata* communities connections with gentle and slightly depressed plots of steppe observe in the borders of all its local area of the natural habitat. In conditions of southern fescue-feather-grass steppe its communities only recently preserved better, than other due to the higher stability of *Stipa capillata* for grazing.

Finally, *S. lessingiana* doesn't form own formations at the territory of protected steppe. Its development coincides in time with development of *S. ucrainica.* Just these

species of the pinnate feather-grasses form the silver-white aspect of vegetation. Usually, *S. lessingiana* is found in Askanian steppe as co-dominant; it's role slogtly increase on zoogenic landing (colonies of marmots and gophers) enriched by carbonate. *S. lessingiana* is comparatively resilient to grazing. In pastures it is readily eaten by all kinds of cattle and therefore enjoys success as the best fodder plant of the feather-grasses. In conditions of over-grazing it is greatly depressed and quickly becomes rare in the sward.

The list of the zonal watershed formations of the protected core of the Biosphere Reserve "Askania-Nova" is sufficiently supplement by intrazonal plant communities of depressions. Vegetation of depressions at the territory of "North" and "South" plots of protected core also the Great Chplinsky depression is extremely original. Although in dry years the vegetation of depressions is very similar to the watershed, under flood of the steppe depressions by spring or downpour water it changes cardinally. This phenomenon is named hydrogenic fluctuation. From the border of depression (high part of its slope) to the centre of the bottom the moisture conditions and type of soil changes gradually, the depression vegetation characterized by microzoning, meaning the concentric arrangement of vegetation formations which change each other, sometimes in one depression there are 4 types of vegetation: steppe, meadow, bog, and aquatic.

The tops of depression slopes occupied by typical for watershed steppe feather-grass and fescue communities. At downwards a participation of the mesophytic motley grasses, meadow-steppe and meadow grasses and sedges: *Ferula orienthalis* L., *Phlomoides scythica* (Klokov & Des.-Shost.) Czerep., *Allium regelianum* A. Becker ex Iljin, *Euphorbia virgata* Waldst. et Kit., *Achillea micranthoides* Klokov, *Phalacrachena inuloides* (Fisch. ex Schmalh.) Iljin, *Poa angustifolia*, *Alopecurus pratensis* L., *Carex praecox* etc. increases. In lower parts of depression slopes and in outlines of bottoms the plant cover has expressive meadow structure. The bottoms of depressions are the permanent habitats of meadow and meadow-bog species, which are characterized by splash under flood and the formations cover wide areas, but during dry periods are stay in a suppressed state. Thus, vegetation of depressions is heterogeneous and is an example of the original "phytocenotic symbiosis": in the same territory different plant communities exist, often with different ecological optima and floristic composition, which occur in consecutive order depending on climatic conditions in real time.

The presence of such ecotopes as bottoms has caused an increase in the floristic diversity of Askanian steppe. In depressions of the natural core grow more than 100 species of flowering plants, which are absent in watershed steppe (*Damasonium alisma* Mill., *Elatine hungarica* Moesz, *Juncus sphaerocarpus* Nees, *Rorippa brachycarpa* (C.A. Mey.) Hayek, *Eleocharis palustris* (L.) Roem. & Schult., *Cyperus fuscus* L., *Schoenoplectus lacustris* etc.). It is easy to understand the reason for such territorial distribution of the mentioned plants: all of them are connected with meadow-bog communities which are not present outside the depressions. Of course, the big depression — Great Chapelsky Pod is distinguished by level of floristic richness. Considerably lesser depressions both in area and depth are practically entirely occupied by thicket of *Poa angustifolia*, *Bromopsis inermis*, *Carex praecox* with an admixture of *Carex melanostachya*, *Elytrigia pseudocaesia*, *Peucedanum ruthenicum* M. Bieb., *Asparagus polyphyllus* Steven etc.

Steppe vegetation is characterized by frequent changes of aspect during vegetative season which reflects the diversity of flora as much as possible during the flowering period. So, the spring aspect is formed by *Gagea* spp., *Valeriana tuberosa* L., *Iris pumila* L., *Tulipa scythica* Klokov & Zoz and *T. schrenkii* Regel, *Stipa ucrainica* and *S. lessingiana*. Summer "palettes" are provided by flowering of some representatives of perennial herbs: *Phlomis pungens* Willd., *Galium ruthenicum* Willd., *Medicago romanica* Prodán, *Linaria biebersteinii* Besser, *Ferula orienthalis*, *Inula britannica* L. тощо. Autumn aspects are caused by flowering of *Stipa capillata*, *Crinitaria linosyris* (L.) Less., *Hylotelephium stepposum* (Boriss.) Tzvelev etc.

The typical ephemerals of the Askanian steppe are *Holosteum umbellatum* L., *Valerianella carinata* Loisel., *V. costata* (Steven) Betcke, *Erophila verna* (L.) Besser, *Veronica triphyllos* L., *V. arvensis* L., *V. verna* L., *Arenaria serpillifolia* L., *Androsace maxima* L., *A. elongata* L. Group of ephemerides includes *Tulipa schrenkii*, *Valeriana tuberosa* L., *Iris pumila*, *Gagea bohemica* (Zauschn.) Schult. & Schult. f., *G. paczoskii* (Zapał.) Grossh., *G. novoascanica* Klokov, *G. pusilla* (F.W. Schmidt) Schult. & Schult. f., *Bellevalia sarmatica* (Georgi) Woronow.

From motley-grass group representatives must be mentioned *Galium ruthenicum*, *Verbascum phoeniceum* L., *Limonium sareptanum* (A. Becker) Gams, *Goniolimon tataricum* (L.) Boiss., *Seseli tortuosum* L., *Dianthus guttatus* M. Bieb., *D. lanceolatus* Steven ex Rchb., *D. andrzejowskianus* (Zapał.) Kulcz., *Potentilla argentea* L. та *P. laciniosa* Kit. ex Nestl., *Hylotelephium stepposum*, *Phlomoides hybrida* (Zelen.) R. Kam. & Machmedov та *Phlomis pungens*, *Falcaria vulgaris* Bernh., *Medicago romanica*, *Crinitaria linosyris*, *Euphorbia seguierana* Neck., *Tanacetum millefolium* (L.) Tzvelev etc.

The important characteristic of the protected steppe vegetation is a presence of plant communities included into Green Book of Ukraine: *Stipeta ucrainicae*, *Stipeta capillatae*, *Stipeta lessingianae, Amygdaleta nanae*.

Extraordinary values have rare components of Askanian steppe flora. In total, the list of rare and endangered species includes 33 species with different protected status. 7 species of vascular of the natural core include to the IUCN Red List, 10 — to the European Red List, 20 — to the Red Data Book of Ukraine, 7 — to the Red List of Kherson region, 2 — to the Annex I of Bern Convention and 1 — to the List of CITES. They are: *Astragalus henningii* (Steven) Klokov, *A. reduncus* Pall., *Centaurea taliewii* Kleop., *Phlomis scythica* Klokov & Des.-Shost., *Damasonium alisma* Mill., *Caragana scythica* (Kom.) Pojark., *Stipa capillata* L., *Stipa lessingiana* Trin. et Rupr., *Stipa ucrainica* P. Smirn., *Lythrum thymifolia* L., *Elatine hungarica* Moeszi, *Juncus sphaerocarpus* Nees., *Tulipa schrenkii* Regel, *T. scythica* Klok. et Zoz, *Allium regelianum* A. Beck. ex Iljin etc.

In addition, sozological status in flora of the Biosphere reserve "Askania-Nova" natural core have 3 species of bryophytes, 4 species of lichens and 2 species of fungi.

An endemic element of Askanian steppe flora includes more than 70 species (eu-endemics, confinite and extensive hemi-endemics). Total level of flora's endemizm is about 14%, portion of eu-endemics and confinite hemi-endemics only 3%.

Euendemic core of Askanian steppe flora represents by *Achillea micranthoides* Klokov., *Allium scythicum* Zoz., *Astragalus concavus* Boriss., *Gagea novoascanica* Klokov.,

Phlomoides scythica (Klokov & Des.-Shost.) Czerep., *Polygonum achersonianum* H. Gross (= *P. scythicum* Klokov) and *Tulipa scythica* Klokov & Zoz.

Generally, chorological spectrum of the endemic element of flora forms by the following groups: Black Sea-Caspian, Black Sea, Pannonian-Black Sea-Caspian, Dnieper-Molochansk, East-Black Sea-Caspian and East-Black Sea, South-Black-Sea and Black Sea-Azov, West-Black Sea, Pannonian- West-Black Sea, Dnieper-Don, Pannonian-Black Sea and Bug-Molochansk.

Author index