

Environmental Priority Assessment of Plant Communities Steppes in the Rostov Region

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Abstract: This paper provides an overview of the steppe vegetation syntaxonomy of the Don Basin, which is represented by four classes of eco-floristic classification and the estimate of environmental significance of steppe communities according criteria of the EUNIS and ASCI's. The resulting materials are important for the identifying a geographically representative array of key natural areas, new Europe important EUNIS habitats and are essential to construe the Pan-European ecological network.

Key words: Rostov Region • Environmental priority assessment • Plant communities steppes • Biodiversity conservation

INTRODUCTION

Under conditions of heavy fragmenting and growing technogenic influence, the principal objective of a strategy to conserve steppe biodiversity is to support transport and functional integrity of most natural steppe areas [1]. If the plant community classification that is fundamental to design ecological nets would be disregarded it would be impossible to identify ECONET structural elements by indicator objects [2, 3] that are species and habitats of high conservation value.

In terms of eco-floristic classification authentic multi-grass, bunch and gramineae communities; bunch-gramineous communities; desertified semi-shrub and bunch-gramineous communities were classified as communities of a single class *Festuco-Brometea* Br.-Bl. et Tx. 1943; petrophyte vegetation was related to the class *Helianthemo-Thymetea* Romashchenko, Didukh et Solomakha 1996; psammophyte communities were related to the class *Festucetea vaginatae* Soo em. Vicherek 1972; halophyte vegetation of alkali or solonetz grounds and hemi-halophyte derivative communities were related to the class *Festuco-Puccinellietea* Soü ex Vicherek 1973 [4].

In this research selecting criteria for plant community assessment indicators is understood as a very important instrument to identify key natural areas and corridors regarding that they are basic structural components of an ecological network.

Main principles of plant community assessment for conservation were formulated in the classic steppe research by E.M. Lavrenko [5,6]. Lavrenko principles were further developed [7]. At the international level the system of species threat assessment and criteria to identify conservation most valuable vegetation objects in Europe was elaborated under programs of international environmental organizations (WWF, IUCN), Global Strategy for Plant Conservation implemented in its important plant areas (IPA), Pan-European Biological and Landscape Diversity Strategy.

According to above principal provisions our conservation priority assessment of plant communities was construed as expert estimation that included five independent criteria (Table 1).

Criterion A: Taking into account that some species proposals for regional red lists may be prejudiced we also involved the list of Appendix I to the Bern Convention [7]. According to criterion A we analyzed rare plant phytocenotic distribution (Table 1) that totally figured 85 protected species in the studied communities. Of which 35 species are listed in the Red Book of RF [8] and 50 species are listed in the Red Book of Rostov Region [9]. It is essential that cenosis flora of the above described associations contains many local endemics of Don Basin and Azov surrounding but they are only regional protected species (*Genista scythica*, *Hyacinthella*

pallasiana, *Onosma tanaitica* and others). Criterion A (v) is therefore important to assess conservation communities and Areas of Special Conservation Interest (ASCI's).

Eleven taxons are listed in Appendix I to the Bern Convention. Of these 11 taxons only 7 species are listed in the Red Books of RF and Rostov Region; 3 species are protected species only inside the Rostov Region; 1 species is not a protected species in Russia.

Most abundant in rare species are communities of five associations: *Medicago romanicae-Festucetum valesiacae* (28 species) è *Euphorbio seguieranae-Thymetum dimorphi* (19 species), *Medicago romanicae-Stipetum ucrainicae* (16 species), *Stipetum lessingiana* (15 species), *Trifolio alpestris-Stipetum tirsae* (15 species). These communities have the highest index value (A (v) 1). One association of *Trifolio alpestris-Stipetum tirsae* includes the largest number of species (4 species totally) of Appendix I to the Bern Convention. Fourteen associations have no Appendix I species.

EUNIS code of the European habitat classification was applied to define typological and eco-floristic classification units that we identified on the study area [10]. In total we identified 5 habitats as EUNIS association communities which are: E1.2. Perennial calcareous grassland and basic steppes; E1.3. Mediterranean xeric grasslands; E6.2. Continental inland salt steppes; X29. Salt lake islands; X35. Inland sand dunes (Tab. 2). It is essential that EUNIS does not represent the entire array of existing steppe habitats of the Don Basin. E1.3. Mediterranean xeric grasslands of EUNIS are described as "Meso- and thermo-Mediterranean xerophile, mostly open, short-grass perennial grasslands rich in therophytes; therophyte communities of oligotrophic soils on base-rich, often calcareous substrates". Unlike this description, in the steppe part of the Don Basin petrophyte communities are often represented by semifrutex and semi-shrub cenoses known as "steppe tomillars" but not grasslands. Yet therophytes are very rare in the steppe tomillars, semi-shrub and semifrutex are important cenosis formers in cenofloras as well as perennial grass tulips and these tulips often are ephemeroids and hemi-ephemeroids. Consequently, to adapt EUNIS classification to Don Basin steppes it may be added with some new habitats that are by far not in EUNIS. These new habitats should be plain communities of petrophytes that grow on rock outcrops of chalk, limestone, clay and sandy shale.

Rarity (R) index describes plant community occurrence depending on their areal size and on how frequent they are inside their area. Rarity is estimated according to the species rarity scale [11] that was later adapted for plant communities [12].

Nature protection measures (N) index estimates the share of communities of the total diversity array that are inside nature protection territories. Concerning threats this category implies that a community is under best protection if it is inside a nature protected area.

Floristic-phytocenological value (F) is an aggregate index of conservation priority.

Subsequently, we have construed our plant community assessment on the basis of bio-ecological parameters of biodiversity conservation which are community range reduction tendencies, community rarity. Understanding that location and legal factors substantially affect indicator objects and they are necessary to support sustainability and biodiversity in our region were also included these factors in the criteria.

Tables 1 and 2 show that if associations contain many endemic, relict and other rare species or border range species they will attain top values of floristic-phytocenological index (F1). Top F1 associations feature with species combinations of various classes, habitat border locations, species abundance and complex structure.

The largest group is formed by petrophyte communities that are often serial. In these communities the strongest ecoton effect is displayed. Other high values of F1 index were shown by associations of classes *Festuco-Brometea*: *Bellevalliae sarmaticae-Stipetum pennatae* and *Astragalo ponticae-Brometum squarroso* that enclose pelitophyte and hemi-psammophyte variations of multi-grass and bunch-gramineous steppes and hemi-halophyte communities of desertified semi-shrub and bunch-gramineous association of *Artemisio lerchianae-Poetum bulbosae*. surrounding but they are only regional protected species (*Genista scythica*, *Hyacinthella pallasiana*, *Onosma tanaitica* and others). Criterion A (v) is therefore important to assess conservation communities and Areas of Special Conservation Interest (ASCI's).

Eleven taxons are listed in Appendix I to the Bern Convention. Of these 11 taxons only 7 species are listed in the Red Books of RF and Rostov Region; 3 species are protected species only inside the Rostov Region; 1 species is not a protected species in Russia.

Table 1: Phylogenetic distribution of plant species listed in the Red Book of the Russian Federation, the Red Book of the Rostov Region and Appendix I to the Bern Convention "Species requiring specific habitat conservation measures"

FESTUCO-BROMETEA								
Class	Trifolio alpestris- Stipetum tirsae	Festuco rupicolae- Stipetum capillatae	Bellevaliae sarmatica- Stipetum dasypyllae	Plantagini stepposae- Stipetum pennatae	Stipetum pulcherrimae	Centaureo orientalis- Stipetum lessingiana	Sileno wolgensis- Stipetum pulcherrimae	
Species\Number of sites	67	44	44	27	26	59	43	28
Allium lineare
Allium regelianum*
Allium savranicum
Anemone sylvestris
Angelica archangelica
Artemisia hololeuca*
Artemisia salsoloides*
Asperula tephrocarpa	1	.	.
Astragalus calycinus
Astragalus longipetalus
Astragalus physodes
Astragalus ponticus
Astragalus pubiflorus
Astragalus tanaiticus*
Atraphaxis frutescens
Bellevalia sarmatica*	1	1	.	5	2	3	2	3
Calophaca wolgarica*	1	2	2
Campanula altaica	1	1	.	1	.	.	.	.
Campanula macrostachya	2	.	.	.
Caragana scythica	1	.	1
Catabrosella humilis	1	.	.
Centaurea gerberi
= ? dubjanskyi*
Centaurea ruthenica	1	.	.	2	1	.	1	.
Chaenorhinum klokovii
Cleome donetzica*
Colchicum laetum*
Corylus avellana
Cotoneaster alaunicus*
Crambe tataria
Crocus reticulatus	1	.
Cymbochasma borysthenica*
Delphinium puniceum*	.	.	.	1	.	.	.	.
Delphinium schmalhausenii
Dianthus squarrosus
Diplotaxis cretacea
Echium russicum ||	3	1	1	1	.	1	.	.
Elytrigia stipifolia*	1	.	.
Eremurus spectabilis*
Eriosynaphe longifolia*	1	.	.	.
Erucastrum cretaceum*
Erysimum cretaceum
Euphorbia cretophila
Festuca cretacea
Fritillaria ruthenica*	1	.	.	.	.	.	.	.
Genista scythica
Hedysarum cretaceum*
Hedysarum grandiflorum*	1	.
Hyacinthella pallasiana	1	1	.
Hyssopus cretaceus*
Iris pumila*	1	1	2	1	1	2	2	1
Iris scariosa*
Juniperus sabina
Jurinea cretacea*
Koeleria talievii	.	1	.	.	.	.	.	.
Jurinea cyanoides
Krascheninnikovia ceratoides
Lepidium meyeri*
Linum hirsutum
Linum ucrainicum

Table 1: Continue

FESTUCO-BROMETEA								
Class Associations	Trifolio alpestris- Stipetum tirsae	Festuco rupicolae- Stipetum capillatae	Bellevaliae sarmatica- Stipetum dasypyliae	Plantagini stepposae- Stipetum pennatae	Stipetum pulcherrimae	Stipetum lessingiana	Centaureo orientalis- Stipetum pulcherrimae	Sileno wolgensis- Stipetum pulcherrimae
Species\Number of sites	67	44	44	27	26	59	43	28
<i>Matthiola fragrans*</i>	-	-	-	-	-	-	-	-
<i>Onosma tanaitica</i>	-	-	-	-	-	1	1	-
<i>Paeonia tenuifolia* </i>	1	1	-	1	-	-	1	-
<i>Platanthera bifolia</i>	1	-	-	-	-	-	-	-
<i>Polygala cretacea</i>	-	-	-	-	-	-	-	-
<i>Polygala sibirica</i>	-	-	-	-	-	-	-	-
<i>Psathyrostachys juncea</i>	-	-	-	-	-	-	-	-
<i>Pulsatilla patens ||</i>	1	1	2	-	-	-	-	-
<i>Pulsatilla pratensis*</i>	1	1	2	-	-	-	-	-
<i>Salvia austriaca</i>	-	-	-	-	-	-	-	-
<i>Scrophularia cretacea</i>	-	-	-	-	-	-	-	-
<i>Scrophularia donetzica</i>	-	-	-	-	-	-	-	-
<i>Silene cretacea* </i>	-	-	-	-	-	-	-	-
<i>Serratula tanaitica* </i>	-	-	-	-	-	-	-	-
<i>Silene hellmannii*</i>	-	-	-	-	-	-	-	-
<i>Stipa borysthenica</i>	-	-	1	-	-	-	-	-
<i>Stipa dasypylla*</i>	3	3	4	5	2	-	-	-
<i>Stipa pennata*</i>	5	5	4	5	1	1	-	1
<i>Stipa pulcherrima*</i>	1	1	-	1	5	-	5	5
<i>Stipa tirsa</i>	5	2	2	2	4	-	-	1
<i>Stipa ucrainica</i>	-	1	1	-	3	1	1	4
<i>Stipa zalesskii* </i>	1	-	-	-	2	2	1	1
<i>Thymus calcareus</i>	-	-	-	-	-	1	-	-
<i>Tulipa biebersteiniana</i>	-	1	1	-	1	1	1	1
<i>Tulipa biflora</i>	-	-	-	-	-	-	-	-
<i>Tulipa gesneriana*</i>	-	-	-	-	-	-	-	1
<i>Ventenata dubia</i>	-	-	-	-	-	-	-	-
Total	15	14	10	11	12	15	13	11
Species of Appendix I	4	3	2	2	1	2	2	1

Table 1: Continue

FESTUCO-BROMETEA							
Class Associations	Astragalo ponticae -Dianthetum leptopetalii	Ajugo orientalae- Festucetum pseudoviniae	Medicago romanae- Stipetum ucrainicae	Eryngio campestris- Stipetum ucrainicae	Medicago romanae - Festucetum valesiacae	Astragalo asperi- Medicagoetum romanae	Amorio retusae- Cerastietum syvaschii
Species\Number of sites	32	11	32	65	138	16	46
	2	1	2	3	2	-	1
<i>Allium lineare</i>	-	-	-	-	1	-	-
<i>Allium regelianum* </i>	-	-	-	-	-	-	-
<i>Allium savranicum</i>	-	-	-	-	-	-	-
<i>Anemone sylvestris</i>	-	-	-	-	1	-	-
<i>Angelica archangelica</i>	-	-	-	-	-	-	-
<i>Artemisia hololeuca*</i>	-	-	-	-	-	-	-
<i>Artemisia salsolooides*</i>	-	-	-	-	-	-	-
<i>Asperula tephrocarpa</i>	-	-	-	-	1	-	-
<i>Astragalus calycinus</i>	-	-	1	1	1	-	-
<i>Astragalus longipetalus</i>	-	-	-	-	-	2	-
<i>Astragalus physodes</i>	-	-	-	1	-	-	-
<i>Astragalus ponticus</i>	4	-	-	-	1	-	-
<i>Astragalus pubiflorus</i>	-	-	-	2	-	-	-
<i>Astragalus tanaiticus* </i>	-	-	1	-	-	-	-
<i>Atraphaxis frutescens</i>	-	-	-	-	1	-	-
<i>Bellevalia sarmatica*</i>	2	1	1	2	1	2	4
<i>Calophaca wolgarica*</i>	3	-	-	1	1	-	-
<i>Campanula altaica</i>	-	-	-	-	-	-	-
<i>Campanula macrostachya</i>	-	-	-	-	-	-	-
<i>Caragana scythica</i>	1	-	-	-	-	-	-
<i>Catabrosella humilis</i>	-	-	-	-	-	-	-
<i>Centaurea gerberi</i>	-	-	-	-	-	-	-

Table 1: Continue

	FESTUCO-BROMETEA						
Class Associations	Astragalo ponticae -Dianthetum leptopetalii	Ajugo orientalae- Festucetum pseudovinae	Medicago romanae- Stipetum ucrainicae	Eryngio campestris- Stipetum ucrainicae	Medicago romanicae - Festucetum valesiacae	Astragalo asperi- Medicagoetum romanae	Amorio retusae- Cerastietum syvaschici
Species\Number of sites	32	11	32	65	138	16	46
	2	1	2	3	2	-	1
= ? dubjanskyi* ||							
Centaurea rutenica	-	-	-	-	1	1	-
Chaenorhinum klokovi	-	-	-	-	-	-	-
Cleome donetzica*	-	-	-	-	1	-	-
Colchicum laetum*	-	-	1	-	-	-	-
Corylus avellana	-	-	-	-	-	-	-
Cotoneaster alaunicus*	-	-	-	-	1	-	-
Crambe tataria ||	1	1	-	1	1	-	-
Crocus reticulatus	-	-	-	-	-	-	-
Cymbochasma borysthenica*	-	-	-	-	1	-	-
Delphinium puniceum*	-	-	-	-	1	-	-
Delphinium schmalhausenii	-	-	-	-	-	-	-
Dianthus squarrosus	-	-	1	-	-	-	-
Diplotaxis cretacea	-	-	-	-	-	-	-
Echium russicum ||	-	-	-	1	-	-	-
Elytrigia stipifolia*	-	-	-	-	-	-	-
Eremurus spectabilis*	-	-	2	-	-	-	-
Eriosynaphe longifolia*	-	-	-	-	-	-	1
Erucastrum cretaceum*	-	-	-	-	-	-	-
Erysimum cretaceum	-	-	-	-	-	-	-
Euphorbia cretophila	-	-	-	-	-	-	-
Festuca cretacea	-	-	-	-	-	-	-
Fritillaria rutenica*	-	-	-	-	-	-	-
Genista scythica	-	-	-	-	-	-	-
Hedysarum cretaceum*	-	-	-	-	-	-	-
Hedysarum grandiflorum*	-	-	-	-	-	-	-
Hyacinthella pallasiana	-	-	-	-	1	-	-
Hyssopus cretaceus*	-	-	-	-	-	-	-
Iris pumila*	3	-	1	2	1	1	1
Iris scariosa*	-	-	-	-	-	-	-
Juniperus sabina	-	-	-	-	-	-	-
Jurinea cretacea*	-	-	-	-	-	-	-
Koeleria talievii	-	-	-	-	-	-	-
Jurinea cyanoides ||	-	-	-	-	-	-	-
Krascheninnikovia ceratoidea	-	-	-	-	-	-	-
Lepidium meyeri*	-	-	-	-	-	-	-
Linum hirsutum	-	-	-	-	-	-	-
Linum ucrainicum	-	-	-	-	-	-	-
Matthiola fragrans*	-	-	-	-	-	-	-
Onosma tanaitica	-	-	-	-	-	-	-
Paeonia tenuifolia* ||	-	-	-	-	-	-	-
Platanthera bifolia	-	-	-	-	-	-	-
Polygala cretacea	-	-	-	-	-	-	-
Polygala sibirica	-	-	-	-	-	-	-
Psathyrostachys juncea	-	-	-	-	1	-	-
Pulsatilla patens ||	-	-	-	-	-	-	-
Pulsatilla pratensis*	-	-	-	-	1	-	-
Salvia austriaca	-	-	-	-	-	-	-
Scrophularia cretacea	-	-	-	-	-	-	-
Scrophularia donetzica	-	-	-	-	1	-	-
Silene cretacea* ||	-	-	-	-	-	-	-
Serratula tanaitica* ||	-	-	-	-	-	-	-
Silene hellmannii*	-	-	-	-	-	-	-
Stipa borysthenica	-	-	1	-	-	-	-
Stipa dasypylla*	-	-	2	-	1	-	-
Stipa pennata*	-	-	1	1	1	1	-
Stipa pulcherrima*	4	-	1	-	1	-	-
Stipa tirsa	-	-	1	-	-	1	-
Stipa ucrainica	2	1	4	5	1	1	4
Stipa zalesskii* ||	3	-	3	1	1	-	1

Table 1: Continue

FESTUCO-BROMETEA							
Class Associations	Astragalo ponticae -Dianthetum leptopetalii	Ajugo orientalae- Festucetum pseudovinae	Medicago romanae- Stipetum ucrainicae	Eryngio campestris- Stipetum ucrainicae	Medicago romanicae - Festucetum valesiacae	Astragalo asperi- Medicagoetum romanae	Amorio retusae- Cerastietum syvaschici
Species\Number of sites	32	11	32	65	138	16	46
	2	1	2	3	2	-	1
Thymus calcareus	-	-	-	-	1	-	-
Tulipa biebersteiniana	1	-	1	2	1	-	1
Tulipa biflora	-	-	-	-	-	-	-
Tulipa gesneriana*	1	-	1	2	1	-	3
Ventenata dubia	-	-	-	1	1	-	3
Total	11	3	16	14	28	7	8
Species of Appendix I	2	1	2	3	2	-	1

Table 1: Continue

FESTUCO-BROMETEA							
Class Associations	Agropyri- pectinati- Poetum bulbosae	Artemisio lerchiana - Poetum bulbosae	Astragalo albicalis - Stipetum capillatae	Elytrigio trichophorae- Festucetum rupicolae	Euphorbio seguieranae- Thymetum dimorphi	Convolvulis lineati- Vincetoxietum maeotici	Genisto scythicae- Stipetum adoxiae
Species\Number of sites	64	49	19	6	27	13	9
Allium lineare	-	-	-	-	-	-	-
Allium regelianum* ||	1	-	-	-	-	-	-
Allium savranicum	-	-	-	-	-	-	-
Anemone sylvestris	-	-	-	2	-	-	-
Angelica archangelica	-	-	-	-	-	-	-
Artemisia hololeuca*	-	-	-	-	-	-	-
Artemisia salsoloides*	-	-	2	-	-	-	5
Asperula tephrocarpa	-	-	-	-	2	-	-
Astragalus calycinus	-	-	-	-	-	-	-
Astragalus longipetalus	-	-	-	-	-	-	-
Astragalus physodes	-	1	-	-	-	-	-
Astragalus ponticus	-	-	-	-	-	-	-
Astragalus pubiflorus	-	-	-	-	-	-	-
Astragalus tanaiticus* ||	-	-	-	-	-	-	-
Atraphaxis frutescens	-	-	-	-	-	-	-
Bellevalia sarmatica*	4	-	-	-	1	-	-
Calophaca wolgarica*	-	1	-	-	-	-	-
Campanula altaica	-	-	-	-	-	-	-
Campanula macrostachya	-	-	-	-	-	-	-
Caragana scythica	-	-	-	-	1	2	-
Catabrosella humilis	-	1	-	-	-	-	-
Centaura gerberi	-	-	-	-	-	-	-
=? dubjanskyi* ||	-	-	-	-	-	-	-
Centaurea ruthenica	-	-	-	-	-	-	2
Chaenorhinum klokovii	-	-	-	-	-	-	-
Cleome donetzica*	-	-	-	-	-	-	-
Colchicum laetum*	-	2	-	-	-	-	-
Corylus avellana	-	-	-	-	-	-	-
Cotoneaster alaunicus*	-	-	-	-	-	-	-
Crambe tataria ||	-	-	-	-	-	-	-
Crocus reticulatus	-	-	-	-	1	-	-
Cymbochasma borysthениca*	-	-	-	-	-	-	-
Delphinium puniceum*	-	-	-	-	-	-	-
Delphinium schmalhausenii	-	-	-	1	-	-	-
Dianthus squarrosus	-	-	-	-	-	-	-
Diplotaxis cretacea	-	-	1	-	-	-	-
Echium russicum ||	-	-	-	-	-	-	-
Elytrigia stipifolia*	-	-	-	-	-	-	-
Eremurus spectabilis*	-	-	-	-	-	-	-
Eriosynaphe longifolia*	1	1	-	-	-	-	-
Erucastrum cretaceum*	-	-	-	-	-	-	-
Erysimum cretaceum	-	-	-	-	-	-	-
Euphorbia cretophila	-	-	-	-	3	5	3
Festuca cretacea	-	-	-	-	-	-	-

Table 1: Continue

	FESTUCO-BROMETEA						
Class	Agropyri pectinati- Poetum Associtations Species\Number of sites	Artemisio lerchianae - Poetum bulbosae	Astragalo albicaulis - Stipetum capillatae	Elytrigio trichophorae- Festucetum rupicolae	Euphorbio seguieranae- Thymetum dimorphi	Convolvulis lineati- Vincetoxietum maeotici	Genisto scythicae- Stipetum adoxae
Fritillaria ruthenica*
Genista scythica	2	5	5
Hedysarum cretaceum*
Hedysarum grandiflorum*	1	1	3
Hyacinthella pallasiana	4	5	4
Hyssopus cretaceus*
Iris pumila*	1	1	1	.	4	3	.
Iris scariosa*	.	1	.	.	.	.	.
Juniperus sabina

Table 1: Continue

	FESTUCO-BROMETEA						
Class	Agropyri pectinati- Poetum Associtations Species\Number of sites	Artemisio lerchianae - Poetum bulbosae	Astragalo albicaulis - Stipetum capillatae	Elytrigio trichophorae- Festucetum rupicolae	Euphorbio seguieranae- Thymetum dimorphi	Convolvulis lineati- Vincetoxietum maeotici	Genisto scythicae- Stipetum adoxae
Jurinea cretacea*
Koeleria talievii
Jurinea cyanoides	1	1	.
Krascheninnikovia ceratoides	.	.	3	.	.	.	.
Lepidium meyeri*
Linum hirsutum	.	.	1	.	1	.	1
Linum ucrainicum
Matthiola fragrans*
Onosma tanaitica	.	.	3	1	1	.	1
Paeonia tenuifolia* ||	.	.	1	.	.	.	.
Platanthera bifolia
Polygala cretacea	.	.	1	1	1	.	.
Polygala sibirica	.	.	2	.	.	.	.
Psathyrostachys juncea	.	1	.	.	.	.	.
Pulsatilla patens
Pulsatilla pratensis*
Salvia austriaca	1	.
Scrophularia cretacea
Scrophularia donetzica
Silene cretacea*
Serratula tanaitica*
Silene hellmannii*	1	1	.
Stipa borysthenica
Stipa dasypylla*
Stipa pennata*	.	.	1	1	.	.	.
Stipa pulcherrima*	.	.	1	.	1	.	5
Stipa tirsa
Stipa ucrainica	1	1	.	.	1	.	.
Stipa zalesskii* ||	1	1	.	.	1	.	.
Thymus calcareus	.	.	2	.	.	5	3
Tulipa biebersteiniana	2	2	.	.	3	.	2
Tulipa biflora	.	1	.	.	.	.	.
Tulipa gesneriana*	4	2	.	.	1	.	.
Ventenata dubia	2	.	.	.	.	.	.
Total	9	13	12	5	19	10	11
Species of Appendix I	2	1	1	-	2	1	-

Table 1: Continue

	HELIANTHEMO-THYMETEA							
Class	Matthiolo fragransi- Atraphaxietum frutescens	Hedysaro cretacei- Melicetum transsilvanicae	Lepidio meyeri- Scrophularietum cretacei	Erysimo cretacei- Festucetum cretacei	Artemisio hololeucae - Polygaletum cretaceae	Astragaletum albicaulis	Genisto scythicae- Artemisietum salsoloidis	Sileno borysthenicae- Hyssopetum angustifolii
Species\Number of sites	11	4	5	12	8	7	8	3
Allium lineare
Allium regelianum*
Allium savanicum
Anemone sylvestris	.	.	.	1	.	.	.	.
Angelica archangelica	.	.	.	1	.	.	.	.
Artemisia hololeuca*	5	.	.	.
Artemisia salsoloides*	3	5	5	.	4	5	5	.
Asperula tephrocarpa	5	.	.	1	4	3	4	.
Astragalus calycinus
Astragalus longipetalus
Astragalus physodes
Astragalus ponticus
Astragalus pubiflorus
Astragalus tanaiticus*
Atraphaxis frutescens	3	.	.	.	.	.	.	.
Bellevalia sarmatica*
Calophaca wolgarica*
Campanula altaica
Campanula macrostachya
Caragana scythica
Catabrosella humilis
Centaurea gerberi
= ? dubjanskyi*
Centaurea ruthenica	4	.	.	.
Chaenorhinum klokovi	.	.	.	1	.	.	.	.
Cleome donetzica*
Colchicum laetum*
Corylus avellana	.	.	.	1	.	.	.	.
Cotoneaster alaunicus*
Crambe tataria
Crocus reticulatus
Cymbochasma borysthenica*
Delphinium puniceum*
Delphinium schmalhausenii
Dianthus squarrosus
Diplotaxis cretacea	2	.
Echium russicum
.Elytrigia stipifolia*.	4	.
Eremurus spectabilis*
Eriosynaphe longifolia*
Erugastrum cretaceum*	.	.	.	1	.	.	1	.
Erysimum cretaceum	.	.	.	2	.	.	.	.
Euphorbia cretophila	5	.
Festuca cretacea	1	.	2	5	.	3	.	.
.Fritillaria rutenica*	5	.
.Genista scythica	5	.
Hedysarum cretaceum*	.	5	.	.	.	.	.	.
Hedysarum grandiflorum*	4	.
Hyacinthella pallasiana	3	.
Hyssopus cretaceus*	5	5	5	3	5	4	.	.
Iris pumila*
Iris scariosa*
Juniperus sabina
Jurinea cretacea*	1	.	.

Table 1: Continue

HELIANTHEMO-THYMETEA								
Class	Matthiolo fragransi- Atraphaxietum frutescens	Hedysaro cretacei- Melicetum transsilvanicae	Lepidio meyeri- Scrophularietum cretacei	Erysimo cretacei- Festucetum cretacei	Artemisio hololeucae - Polygaletum cretaceae	Astragaletum albicaulis	Genisto scythicae- Artemisietum salsoloidis	Sileno borysthenicae- Hyssopetum angustifoliae
Species\Number of sites	11	4	5	12	8	7	8	3
Koeleria talievii	.	.	.	.	.	.	.	.
Jurinea cyanoides ||	.	.	.	.	.	.	.	.
Krascheninnikovia ceratooides	1	.	.	.	.	.	.	.
Lepidium meyeri*	.	.	5	.	.	.	.	.
Linum hirsutum	.	.	.	1	.	.	2	.
Linum ucrainicum	.	.	.	.	5	.	.	.
Matthiola fragrans*	5	.	.	.	3	.	.	.
Onosma tanaitica	1	.	.	1	2	2	5	.
Paeonia tenuifolia* ||	.	.	.	.	.	.	.	.
Platanthera bifolia	.	.	.	.	.	.	.	.
Polygala cretacea	.	.	.	2	1	.	2	.
Polygala sibirica	.	.	.	.	.	.	.	.
Psathyrostachys juncea	.	.	.	.	.	.	.	.
Pulsatilla patens ||	.	.	.	.	.	.	.	.
Pulsatilla pratensis*	.	.	.	.	.	.	.	.
Salvia austriaca	.	.	.	.	.	.	.	.
Scrophularia cretacea	.	3	5	2	2	3	.	.
Scrophularia donetzica	.	.	.	.	.	.	.	.
Silene cretacea* ||	2	.	.	.	.	.	.	.
Serratula tanaitica* ||	1	.	.	.	.	.	.	.
Silene hellmannii*	.	.	.	.	.	.	.	.
Stipa borysthenica	.	.	.	.	.	.	.	.
Stipa dasypylla*	.	.	.	.	.	.	.	.
Stipa pennata*	.	.	.	.	.	.	.	.
Stipa pulcherrima*	.	.	.	.	.	1	3	.
Stipa tirsia	.	.	.	.	.	.	.	.
Stipa ucrainica	.	.	.	.	.	.	.	.
Stipa zalesskii* ||	.	.	.	.	.	.	.	.
Thymus calcareus	2	.	.	1	5	3	5	5
Tulipa biebersteiniana	.	.	.	.	.	.	.	.
Tulipa biflora	.	.	.	.	.	.	.	.
Tulipa gesneriana*	.	.	.	.	.	.	.	.
Ventenata dubia	.	.	.	.	.	.	.	.
Total	11	4	5	14	10	9	14	2
Species of Appendix I	2	-	-	-	-	-	-	-

Table 1: Continue

F. V.									F-P	
Class	Secalo- Stipetum borysthenicae	Hieracio echioidis- Stipetum borysthenicae	Scirpido- Genistaetum sibiricae	Artemisio arenariae- Potentilletum astracanicae	Artemisio arenariae- Festucetum beckeri	Centaureo gerberi- Agropyretum tanaitici	Poo bulbosae- Artemisietum pauciflorae			
Species\Number of sites	16	36	10	5	38	33	22			
Allium lineare			
Allium regelianum* ||	.	.	1	.	.	.	.
Allium savranicum	.	1	.	.	.	.	.
Anemone sylvestris			
Angelica archangelica			
Artemisia hololeuca*			
Artemisia salsoloides*	1			
Asperula tephrocarpa			
Astragalus calycinus	.	.	.	1	.	.	.			
Astragalus longipetalus	.	1	.	.	.	.	.

Table 1: Continue

	F. V.	Hieracio-	Scirpido-	Artemisio	Artemisio	Centaureo	F-P
Class	Secalo-	echioidis-	Genistaetum	arenariae-	arenariae-	gerberi-	
Associations	Stipetum	Stipetum	sibiricae	Potentilletum	Festucetum	Agropyretum	bulbosae-
Species\Number of sites	16	36	10	5	38	33	22
Astragalus physodes
Astragalus ponticus
Astragalus pubiflorus
Astragalus tanaiticus* ||	1	1	.	.	.	.	.
Atraphaxis frutescens
Bellevalia sarmatica*	1
Calophaca wolgarica*
Campanula altaica
Campanula macrostachya
Caragana scythica
Catabrosella humilis
Centaurea gerberi	1	1	.	.	.	5	.
= ? dubjanskyi*
Centaurea rutenica
Chaenorhinum klokovii
Cleome donetzica*
Colchicum laetum*
Corylus avellana
Cotoneaster alaunicus*
Crambe tataria
Crocus reticulatus
Cymbochasma borysthenica*
Delphinium puniceum*
Delphinium schmalhausenii
Dianthus squarrosus	2	1	.
Diplotaxis cretacea
Echium russicum
Elytrigia stipifolia*
Eremurus spectabilis*
Eriosynaphe longifolia*
Erucastrum cretaceum*
Erysimum cretaceum
Euphorbia cretophila
Festuca cretacea
Fritillaria rutenica*
Genista scythica
Hedysarum cretaceum*
Hedysarum grandiflorum*
Hyacinthella pallasiana
Hyssopus cretaceus*
Iris pumila*	.	1	.	4	.	.	1
Iris scariosa*
Juniperus sabina	1	.	.
Jurinea cretacea*
Koeleria talievii	.	1	.	.	.	.	.
Jurinea cyanoides
Krascheninnikovia ceratooides
Lepidium meyeri*
Linum hirsutum
Linum ucrainicum
Matthiola fragrans*
Onosma tanaitica
Paeonia tenuifolia*
Platanthera bifolia

Table 1: Continue

	F. V.						F-P
Class Associations	Secalo- Stipetum borysthenicae	Hieracio- echiodis- Stipetum borysthenicae	Scirpoido- Genistaetum sibiricae	Artemisio- arenariae- Potentilletum astracanicae	Artemisio- arenariae- Festucetum beckeri	Centaureo- gerberi- Agropyretum tanaiticci	Poo- bulbosae- Artemisieturn pauciflorae
Species\Number of sites	16	36	10	5	38	33	22
Polygala cretacea	-	-	-	-	-	-	-
Polygala sibirica	-	-	-	-	-	-	-
Psathyrostachys juncea	-	-	-	-	-	-	-
Pulsatilla patens ||	-	1	-	-	-	-	-
Pulsatilla pratensis*	1	1	-	-	1	1	-
Salvia austriaca	-	-	-	-	-	-	-
Scrophularia cretacea	-	-	-	-	-	-	-
Scrophularia donetzica	-	-	-	-	-	-	-
Silene cretacea* ||	-	-	-	-	-	-	-
Serratula tanaitica* ||	-	-	-	-	-	-	-
Silene hellmannii*	-	-	-	-	-	-	-
Stipa borysthenica	5	5	3	3	1	1	-
Stipa dasypylla*	-	-	-	-	-	-	-
Stipa pennata*	-	1	-	2	-	-	-
Stipa pulcherrima*	-	1	-	-	-	-	-
Stipa tirsia	-	-	-	-	-	-	-
Stipa ucrainica	-	-	-	1	-	-	1
Stipa zalesskii* ||	-	-	-	-	-	-	-
Thymus calcareus	-	-	-	-	-	-	-
Tulipa biebersteiniana	-	-	-	-	-	-	2
Tulipa biflora	-	-	-	-	-	-	1
Tulipa gesneriana*	-	-	-	-	-	-	1
Ventenata dubia	-	-	-	-	-	-	2
Total	4	11	2	5	5	4	8
Species of Appendix I	1	2	1	-	-	-	-

Notes*

*Species listed in the Red Book of the Russian Federation; || - species (bold font) listed in Appendix I "Species requiring specific habitat conservation measures"; classes F. V. - FESTUCETEA VAGINATAE; F-P - FESTUCO-PUCCINELLIETALIA; species occurrence index: 1 - singly occurred, very rare (the species mentioned in a one or few descriptions); 2 - rare (low number of mentioning in descriptions); 3 - sporadic (medium number of mentioning in descriptions); 4 - common (medium and high number of mentioning in descriptions); 5 - most common (highest number of mentioning in descriptions).

Table 2: Conservation priority assessment for steppe plant communities in Don Basin

	Associations \ Criteria	A	EUNIS	R	N	F
Xeropojon eurasiticum, Steppae	Class FESTUCO-BROMETEA					
Abundant multi-grass bunch-gramineous Black Sea eastern surrounding communities of peliophytes and hemi-psammophytes	Trifolio alpestris-Stipetum tirsae Bellevalia sarmaticae-Stipetum pennatae	A (v) 1 A (v) 2	E1.2. E1.2.	R 2 R 7	N 1 N 0	F 2 F 1
Abundant multi-grass bunch-gramineous Black Sea western surrounding communities of peliophytes and hemi-psammophytes	Centaureo orientalis-Stipetum pulcherrimae Plantagini stepposae-Stipetum pulcherrimae	A (v) 2 A (v) 2	E1.2. E1.2.	R 3 R 3	N 1 N 1	F 3 F 2
Multi-grass bunch-gramineous Black Sea surrounding communities of hemi-psammophytes	Stipetum capillatae Festuco rupicolae-Stipetum dasypyllae	A (v) 2 A (v) 2	E1.2. E1.2.	R 2 R 2	N 2 N 2	F 3 F 3
Multi-grass bunch-gramineous Black Sea eastern surrounding communities of peliophytes	Silene wolgensis-Stipetum pulcherrimae Astragalo ponticale-Dianthetum leptopetalii	A (v) 2 A (v) 2	E1.2. E1.2.	R 2 R 7	N 1 N 3	F 3 F 1
Multi-grass bunch-gramineous Black Sea western surrounding communities of peliophytes	Ajugo orientalae-Festucetum pseudoviniae Stipetum lessingianae Medicago romanicae-Stipetum ucrainicae	A (v) 4 A (v) 1 A (v) 1	E1.2. E1.2. E1.2.	R 6 R 2 R 2	N 2 N 1 N 1	F 3 F 2 F 2
Multi-grass bunch-gramineous Black Sea surrounding communities of petrophytes	Astragalo albicalus - Stipetum capillatae Elytrigio trichophorae-Festucetum rupicolae Euphorbi segueriana-Thymetum dimorphi Convolvulus lineati-Vincetoxicetum maeotici Genisto scythicae-Stipetum adoxae	A (v) 2 A (v) 3 A (v) 1 A (v) 2	E1.2. E1.2. E1.3. E1.2.	R 7 R 7 R 7 R 2	N 1 N 1 N 4 F 1	F 2 F 1 F 1 F 3
Bunch-gramineous Black Sea eastern surrounding communities of peliophytes	Medicago romanicae - Festucetum valesiacae	A (v) 1	E1.3.	R 2	N 1	F 2
Bunch-gramineous Black Sea western surrounding communities of peliophytes	Eryngio campestris-Stipetum ucrainicae	A (v) 2	E1.2.	R 2	N 3	F 3
Bunch-gramineous Volga Left (eastern) Bank surrounding Kazakh steppe communities of peliophytes	Astragalo asperi-Medicagoetum romanicae	A (v) 3	E1.3.	R 3	N 0	F 2
Semi-shrub and bunch-gramineous Black Sea to Caspian west surrounding communities of hemi-halophytes	Amorio retusae-Cerastietum syvaschici Agropyri pectinati-Poetum bulbosae	A (v) 3 A (v) 3	E6.2. E6.2., X29.	R 5 R 5	N 1 N 1	F 2 F 2
Semi-shrub and bunch-gramineous Black Sea eastern surrounding to Caspian west surrounding communities of hemi-halophytes	Artemisio lerchianae - Poetum bulbosae Class FESTUCETEA VAGINATAE	A (v) 2	E6.2.	R 5	N 1	F 1

Table 2: Continue

	Associations \ Criteria	A	EUNIS	R	N	F
Bunch-gramineous Black Sea surrounding communities of psammophytes	Secalo-Stipetum borysthenicae	A (v) 3	E1.2.	R 1	N 1	F 4
	Hieracio echoidis-Stipetum borysthenicae	A (v) 2	E1.2. X35.	R 1	N 1	F 3
	Scirpido-Genistaetum sibiricae	A (v) 4	E1.2.	R 5	N 3	F 3
Psammophytion	Artemisio arenariae-Potentillietum astracanicae	A (v) 3	X35.	R 5	N 1	F 2
	Artemisio arenariae-Festucetum beckeri	A (v) 3	X35.	R 0	N 1	F 3
	Centrares gerberi-Agropyretum tanaiticai	A (v) 3	X35.	R 5	N 3	F 1
Petrophyton	Class HELIANTHEMO-THYMETEA					
	Matthiolo fragransi-Atraphaxietum frutescens	A (v) 2	E1.3.	R 7	N 1	F 2
	Hedysaro cretacei-Melicetum transsilvanicae	A (v) 3	E1.3.	R 7	N 0	F 1
	Lepidio meyeri-Sclerophilarietum cretacei	A (v) 3	E1.3.	R 7	N 0	F 1
	Erysimo cretacei-Festucetum cretacei	A (v) 2	E1.3.	R 7	N 3	F 2
	Artemisio hololeucae - Polygaletum cretaceae	A (v) 2	E1.3.	R 7	N 0	F 1
	Genisto scythicae-Artemisiectum salsoloidis	A (v) 2	E1.3.	R 7	N 4	F 1
Halophytion turano-centroasiaticum, Salineta	Sileno borysthenicae-Hyssopetum angustifolii	A (v) 4	E1.3.	R 7	N 0	F 1
	Class FESTUCO-PUCCINELLIETALIA					
	Poo bulbosa-Artemisiectum pauciflorae	A (v) 3	E6.2., X29.	R 0	N 1	F 4

Most abundant in rare species are communities of five associations: *Medicago romanicae-Festucetum valesiacae* (28 species) è *Euphorbio seguieranae-Thymetum dimorphi* (19 species), *Medicago romanicae-Stipetum ucrainicae* (16 species), *Stipetum lessingiana* (15 species), *Trifolio alpestris-Stipetum tirsae* (15 species). These communities have the highest index value (A (v) 1). One association of *Trifolio alpestris-Stipetum tirsae* includes the largest number of species (4 species totally) of Appendix I to the Bern Convention. Fourteen associations have no Appendix I species.

EUNIS code of the European habitat classification was applied to define typological and eco-floristic classification units that we identified on the study area [10]. In total we identified 5 habitats as EUNIS association communities which are: E1.2. Perennial calcareous grassland and basic steppes; E1.3. Mediterranean xeric grasslands; E6.2. Continental inland salt steppes; X29. Salt lake islands; X35. Inland sand dunes (Tab. 2). It is essential that EUNIS does not represent the entire array of existing steppe habitats of the Don Basin. E1.3. Mediterranean xeric grasslands of EUNIS are described as "Meso- and thermo-Mediterranean xerophile, mostly open, short-grass perennial grasslands rich in therophytes; therophyte communities of oligotrophic soils on base-rich, often calcareous substrates". Unlike this description, in the steppe part of the Don Basin petrophyte communities are often represented by semifrutex and semi-shrub cenoses known as "steppe tomillars" but not grasslands. Yet therophytes are very rare in the steppe tomillars, semi-shrub and semifrutex are important cenosis formers in cenofloras as well as perennial grass tulips and these tulips often are ephemeroids and hemi-ephemeroids. Consequently, to adapt EUNIS classification to Don Basin steppes it may be added with some new habitats that are by far not in

EUNIS. These new habitats should be plain communities of petrophytes that grow on rock outcrops of chalk, limestone, clay and sandy shale.

Rarity (R) index describes plant community occurrence depending on their areal size and on how frequent they are inside their area. Rarity is estimated according to the species rarity scale [11] that was later adapted for plant communities [12].

Nature protection measures (N) index estimates the share of communities of the total diversity array that are inside nature protection territories. Concerning threats this category implies that a community is under best protection if it is inside a nature protected area.

Floristic-phytocenological value (F) is an aggregate index of conservation priority.

Subsequently, we have construed our plant community assessment on the basis of bio-ecological parameters of biodiversity conservation which are community range reduction tendencies, community rarity. Understanding that location and legal factors substantially affect indicator objects and they are necessary to support sustainability and biodiversity in our region were also included these factors in the criteria.

Tables 1 and 2 show that if associations contain many endemic, relict and other rare species or border range species they will attain top values of floristic-phytocenological index (F1). Top F1 associations feature with species combinations of various classes, habitat border locations, species abundance and complex structure.

The largest group is formed by petrophyte communities that are often serial. In these communities the strongest ecoton effect is displayed. Other high values of F1 index were shown by associations of classes *Festuco-Brometea*: *Belleviae sarmatica-Stipetum pennatae* and *Astragalo ponticae-Brometum squarroso*

that enclose pelitophyte and hemi-psammophyte variations of multi-grass and bunch-gramineous steppes and hemi-halophyte communities of desertified semi-shrub and bunch-gramineous association of *Artemisia lerchiana-Poetum bulbosae*.

In *Festucetea vaginatae* class only one association *Centaureo gerberi-Agropyretum tanaitici* has attained top F1 value.

All other associations have lower values of F1 index (Table 2).

As it was mentioned above we consider F1 index to be most significant aggregate indicator enabling to assess conservation priority for plant communities. F1 index is also significant because it correlates with other indexes. Likewise the highest floristic-phytocenological number (F1) corresponds, excluding few items, with the highest rarity number (R7).

Summarizing all the indexes for our study area of Don Basin we may conclude that the highest conservation priority is attained by steppe hemi-psammophyte communities of association *Bellevaliae sarmaticae-Stipetum pennatae* (Eunis - E1.2.) and petrophyte communities of associations *Hedysaro cretacei-Melicetum transsilvanicae*, *Lepidio meyeri-Scrophularietum cretacei*, *Artemisio hololeucae-Polygaletum cretaceae*, *Sileno borysthrenicae-Hyssopetum angustifolii* (Eunis - E1.3.) These communities are restricted range communities classified as threatened to disappear but they are so far outside protected areas.

CONCLUSIONS

All associations are scaled in relation with their floristic and phytocenotic significance that enables to identify community associations of highest priority index values. Top F1 index sites are defined as key areas for further development of national, regional and local ECONET.

Inference Conservation priority assessment of Don Basin steppe vegetation and comparison analysis of vegetation classification various units are basic to identify a geographically representative array of key natural areas, new Europe important EUNIS habitats and are essential to construe the Pan-European ecological network.

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