

# The diversity of steppe communities of South Ural (Republic of Bashkortostan, Russia)

Steppe communities of the South Ural (Fig.1), as well as other areas of Europe, have been kept only in conditions of the relief, inconvenient for arable. The basic areas of them are located in the steppe and forest-steppe zones of the Bashkirian Trans-Ural and connected to gentle slopes of the Ural peneplain. In the region of the Bashkirian Cis-Urals steppes are distributed by small sites in a forest-steppe zone only on slopes of the southern expositions.

The Republic of Bashkortostan (RB) is located between 52-56° latitude and 53-60° longitude, its extent from the north to the south - 550 km, from the west to the east is 450 km, occupying the area of 143 sq.km. The continental climate with sharply expressed difference of monthly average

temperatures with the coldest month of January and the warmest one of July is characteristic for the territory of republic. In the region of the Cis-Urals the climate is warmer and less droughty. The mid-annual temperature varies from 2° up to 2,4°C, the mid-annual quantity of precipitations is reduced from the north (500-600 mm) to the south (410-460 mm).

The study based on 720 relevés of steppes communities from forest-steppes of the Bashkirian Pre-Ural, steppe areas of the Bashkirian Trans-Ural and the forest-mountain zones. The classification of the steppes was carried out using the Braun-Blanquet approach (Westhoff, Maarel, 1978) with use of programs TURBO(VEG) and MEGATAB (Hennekens, 1995).

All steppe communities of the Republic of Bashkortostan, are belonging to the class Festuco-Brometea, with 2 orders, 4 alliances, and 18 associations, listed in the table 1.

Eighth of them represent the zonal meadow steppes (Tab.1, column 9, 10, 15) and zonal true steppes (Tab.1, column 1, 2, 7, 8, 11), the others – petrophyte (Tab.1, column 12, 14-17) calciphyte (Tab.1, column 13) and shrubs variants (Tab.1, column 5, 6) of these steppes.

Steppes of a mountain-forest zone which differ by the presence of a group of meadows and saum species (Tab.1, column 3, 4, 16, 17) are specific extrazonal type of steppe vegetation in the Southern Ural (Fig. 5).

Meadow steppes are referred to order Festucetalia valesiacae, true - to order Helictotricho-Stipetalia. Orders correspond to zonal habitats of the steppe area. So the first order is connected with the forest-steppe zone of Eurasia, the second – with the only



Fig.1 Geographic location of the study area

steppe zone of Western Siberia and Kazakhstan.

Meadow steppes and true steppes differ not only by groups of steppe and meadow-steppe species, but also by dominants species of genus *Stipa*. Floristic distinctions of the basic edaphic variants of the true and meadow steppes, except for calciphyte, by percipient of the forbs species (Tab.2)



Fig. 2. Association *Hedysaro grandiflori-Centauretum marschalliana*. Photo: S. Yamalov



### References

- Hennekens S.M. (1995). TURBO(VEG). Software package for input processing and presentation of phytosociological data USER'S guide. IBN-DLO Wageningen et University of Lancaster. 70 p.
- Westhoff V., Maarel E. van der. (1978). The Braun-Blanquet approach. In: Whittaker, R. H. (ed.): Classification of plant communities. The Hague, pp. 287-399.

*Fig. 3 (left). Association Amorio montani-Stipetum zalesskji. Photo: S. Yamalov*



*Fig. 4 Association Galio veri-Stipetum tirsae Photo: S. Yamalov*

*Table 2. Differentiating species edaphic variants of zonal steppes*

| True steppes  |  |   | Meadow steppes   |
|---|--|---|--|
| Variants  |  |   |  |
| Calciphyte  | Hyperpetrophyte  | Petrophyte  | Petrophyte   |
| <i>Salvia nutans</i> (Fig. 6)<br><i>Stipa korshinskyi</i> | <i>Orostachys spinosa</i> (Fig.7)<br><i>Cotoneaster melanocarpus</i><br><i>Tanacetum millefolium</i><br><i>Dianthus acicularis</i>   | <i>Hedysarum grandiflorum</i> (Fig. 8)<br><i>Thymus bashkiriensis</i><br><i>Artemisia frigida</i> | <i>Centaurea marschalliana</i><br><i>Centaurea sibirica</i> (Fig. 9) |
|   | <i>Onosma simplicissima</i> , <i>Echinops ritro</i> , <i>Clausia aprica</i> , <i>Carex pediformis</i> , <i>Aster alpinus</i> , <i>Alyssum tortuosum</i> , <i>Silene baschkirorum</i> , <i>Artemisia campestris</i> |   |  |





*Fig. 5. Mountain steppe in the South Ural. Photo: S. Yamalov*



*Fig. 6. Salvia nutans. Photo: S. Yamalov*



*Fig. 7. Orostachys spinosa. Photo: A. Bayanov*



## Synopsis of steppe vegetation of of South Ural

Class *Festuco-Brometea* Br.-Bl. & Tx. ex Klika & Hadac 1944

Order *Festucetalia valesiaca* Br.-Bl. & Tx. ex Br.-Bl. 1950.

All. *Festucion valesiaca* Klika 1931

Ass. *Poo angustifoliae-Stipetum pennatae* ass. nov. prov.

Ass. *Stipo pennate-Centauretum sibiricae* ass. nov. prov.

Ass. *Leucanthemo vulgaris-Stipetum pennatae* ass. nov. prov.

Order *Helictotricho-Stipetalia* Toman 1969

All. *Amygdalion nanae* V.Golub in Iljina et al. 1991

Ass. *Spiraeo crenati-Caraganetum frutex* ass. nov. prov.

Ass. *Spiraeo hypericifolia-Amygdaletum nanae* Solomesch et al. 1994

All. *Helictotricho-Stipion* Toman 1969

Suball. *Helictotricho desertori-Stipenion rubentis* Toman 1969

Ass. *Diantho acicularis-Orostachietum spinosae* Schubert et al. 1981

Ass. *Hedysaro grandiflori -Centauretum marschallianae* ass. nov. prov. (Fig.2)

Suball. *Artemisio austriacae-Stipenion zalesskii* Korolyuk 2007

Ass. *Stipetum rubentis* Isacenko et Rackovskaja ex Korolyuk ass. nov. prov.

Ass. *Artemisio austriacae-Stipetum lessingiana* ass. nov. prov.

Suball. ?

Ass. *Astragalo austriacae-Stipetum pulcherrimae* ass. nov. prov.

Ass. *Amorio montani-Stipetum zalesskii* ass. nov. prov. (Fig. 3)

Ass. *Galio veri-Stipetum tirsae* ass. nov. prov. (Fig. 4)

Ass. *Salvio nutanti-Stipetum korshinskyi* ass. nov. prov.

All. *Aconogonion alpini* al. nov. prov.

Ass. *Myosotido popovii-Festucetum rupicola* ass. nov. prov.

Ass. *Caragano fruticis-Stipetum pennatae* ass. nov. prov.

Ass. *Koelerio sclerophyllae-Festucetum valesiaca* ass. nov. prov.

Ass. *Centaureo sibiricae-Poetum transbaicalica* Filinov et al. 2002



Fig. 8. *Hedysarum grandiflorum*. Photo: S. Yamalov



Fig. 9. *Centaurea sibirica*. Photo: S. Yamalov

Table 1. Synoptic table of steppe communities of South Ural

| Number of column  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  |  |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Number of relevés   | 12  | 27  | 70  | 41  | 29  | 14  | 63  | 25  | 57  | 18  | 123 | 12  | 15  | 54  | 37  | 43  | 11  |  |
| D.t. <i>Stipetum lessingiana</i>  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Stipa lessingiana</i>  | V   | r   | .   | .   | .   | +   | .   | .   | .   | .   | +   | .   | II  | .   | .   | .   | .   |  |
| D.t. <i>Stipetum rubentis</i>   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Stipa zalesskii</i>  | II  | V   | II  | V   | +   | .   | V   | III | .   | .   | III | II  | .   | IV  | +   | IV  | .   |  |
| <i>Tanacetum uralense</i>   | .   | II  | .   | .   | +   | .   | +   | .   | r   | .   | r   | .   | .   | r   | .   | .   | II  |  |
| D.t. <i>Spiraeo hypericifolia</i> - <i>Amygdaletum nanae</i>                            |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Amygdalus nana</i>   | .   | I   | .   | .   | V   | +   | +   | I   | I   | .   | +   | I   | .   | .   | .   | .   | .   |  |
| <i>Cerasus fruticosa</i>  | .   | r   | I   | r   | IV  | II  | I   | I   | +   | I   | +   | .   | .   | r   | +   | r   | II  |  |
| <i>Spiraea hypericifolia</i>  | .   | .   | r   | I   | III | +   | r   | r   | .   | .   | r   | .   | .   | I   | .   | I   | .   |  |
| D.t. <i>Stipo pennatae</i> - <i>Stipetum zalesskii</i>                                  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Stipa pennata</i>  | .   | .   | IV  | V   | II  | II  | V   | III | V   | V   | III | .   | +   | I   | IV  | I   | .   |  |
| D.t. <i>Galio veri</i> - <i>Stipetum tirsae</i>   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Stipa tirsae</i>   | .   | .   | .   | .   | r   | +   | II  | V   | I   | .   | r   | +   | .   | .   | .   | .   | .   |  |
| D.t. <i>Poo angustifoliae</i> - <i>Stipetum pennatae</i>                                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Onobrychis arenaria</i>  | .   | r   | .   | .   | .   | .   | III | II  | III | IV  | II  | II  | +   | .   | III | .   | .   |  |
| D.t. <i>Leucanthemo vulgaris</i> - <i>Stipetum pennatae</i>                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Leucanthemum vulgare</i>   | .   | .   | .   | .   | .   | .   | .   | .   | I   | IV  | +   | .   | .   | .   | +   | .   | .   |  |
| <i>Filipendula stepposa</i>   | .   | .   | .   | .   | .   | +   | I   | I   | II  | IV  | r   | .   | .   | .   | .   | .   | .   |  |
| <i>Festuca rubra</i>  | .   | .   | .   | .   | .   | .   | .   | .   | .   | III | r   | .   | .   | .   | .   | .   | .   |  |
| <i>Rubus saxatilis</i>  | .   | .   | .   | .   | .   | +   | +   | r   | +   | III | r   | .   | .   | .   | .   | .   | .   |  |
| D.t. <i>Astragalo austriacae</i> – <i>Stipetum pulcherrimae</i>                         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Stipa pulcherrima</i>  | +   | .   | .   | .   | r   | .   | r   | I   | I   | I   | V   | V   | .   | .   | I   | .   | .   |  |
| <i>Astragalus austriacus</i>  | +   | +   | .   | .   | .   | .   | r   | r   | +   | .   | IV  | IV  | III | .   | IV  | .   | .   |  |
| D.t. <i>Hedysaro grandiflori</i> - <i>Stipetum pulcherrimae</i>                         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Hedysarum grandiflorum</i>   | +   | .   | .   | .   | .   | .   | r   | .   | .   | .   | II  | V   | II  | .   | .   | .   | .   |  |
| <i>Ephedra distachya</i>  | +   | I   | .   | .   | .   | .   | .   | .   | .   | .   | II  | III | II  | r   | r   | .   | .   |  |
| D.t. <i>Salvio nutans</i> - <i>Stipetum korshinskyi</i>                                 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Stipa korshinskyi</i>  | III | .   | .   | .   | .   | .   | r   | r   | .   | .   | II  | II  | V   | .   | .   | .   | .   |  |
| <i>Salvia nutans</i>  | I   | .   | .   | .   | .   | .   | .   | .   | r   | .   | II  | II  | III | .   | .   | .   | .   |  |
| D.t. <i>Diantho acicularis</i> - <i>Orostachietum spinosae</i>                          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Orostachys spinosa</i>   | .   | +   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | V   | .   | .   | .   |  |
| <i>Dianthus acicularis</i>  | .   | .   | +   | I   | .   | .   | I   | .   | r   | .   | +   | I   | II  | V   | I   | V   | .   |  |
| D.t. <i>Stipo pennate</i> - <i>Centauretum sibiricae</i>                                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Centaurea sibirica</i>   | .   | .   | V   | V   | .   | .   | r   | I   | +   | +   | II  | .   | .   | +   | V   | V   | V   |  |
| D.t. <i>Centaureo sibiricae</i> - <i>Poetum transbaicalicae</i>                         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Sedum hybridum</i>   | .   | +   | II  | III | III | .   | r   | .   | I   | .   | .   | .   | .   | II  | .   | I   | V   |  |
| <i>Polygonatum odoratum</i>   | .   | .   | IV  | r   | I   | +   | r   | .   | II  | II  | +   | .   | .   | r   | II  | r   | V   |  |
| <i>Artemisia armeniaca</i>  | .   | I   | I   | .   | III | II  | IV  | IV  | III | II  | +   | .   | .   | II  | .   | .   | V   |  |
| D.t. <i>Helictotricho desertori</i> - <i>Stipenion rubentis</i>                         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Onosma simplicissima</i>   | I   | II  | +   | IV  | r   | +   | IV  | II  | II  | I   | IV  | V   | II  | II  | V   | III | .   |  |
| <i>Echinops ritro</i>   | I   | III | II  | V   | .   | .   | II  | II  | II  | I   | IV  | III | III | IV  | IV  | V   | III |  |
| <i>Silene baschkirorum</i>  | .   | r   | I   | III | r   | .   | II  | +   | I   | +   | II  | +   | +   | II  | II  | III | I   |  |
| <i>Potentilla arenaria</i>  | I   | II  | .   | .   | .   | .   | r   | .   | r   | .   | III | III | IV  | +   | I   | .   | .   |  |
| <i>Centaurea marschalliana</i>  | I   | II  | .   | .   | .   | +   | II  | .   | r   | +   | III | II  | III | III | .   | .   | .   |  |
| <i>Allium rubens</i>  | .   | I   | I   | II  | .   | .   | I   | .   | +   | I   | II  | II  | I   | IV  | IV  | V   | .   |  |
| <i>Koeleria sclerophylla</i>  | .   | I   | +   | .   | .   | .   | I   | I   | r   | .   | II  | II  | II  | IV  | II  | V   | +   |  |
| <i>Euphorbia seguierana</i>   | +   | +   | .   | +   | r   | .   | .   | .   | .   | .   | II  | III | II  | II  | III | III | .   |  |
| D.t. <i>Helictotricho</i> - <i>Stipeon</i> and <i>Helictotricho</i> - <i>Stipetalia</i> |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| <i>Helictotrichon desertorum</i>  | I   | IV  | IV  | IV  | +   | .   | IV  | III | II  | III | V   | IV  | III | III | V   | III | .   |  |
| <i>Festuca pseudovina</i>   | III | IV  | V   | II  | IV  | III | IV  | III | IV  | V   | IV  | III | V   | IV  | III | +   | .   |  |
| <i>Potentilla humifusa</i>  | I   | IV  | V   | V   | .   | +   | V   | IV  | III | III | III | .   | +   | III | III | V   | .   |  |
| <i>Poa transbaicalica</i>   | II  | IV  | V   | V   | III | II  | IV  | II  | II  | .   | +   | .   | .   | III | .   | V   | V   |  |
| <i>Salvia stepposa</i>  | II  | II  | .   | .   | I   | III | IV  | V   | III | IV  | IV  | III | III | r   | IV  | .   | III |  |
| <i>Caragana frutex</i>  | IV  | III | III | V   | V   | V   | IV  | III | III | I   | IV  | IV  | IV  | III | V   | II  | V   |  |
| <i>Spiraea crenata</i>  | +   | II  | .   | .   | IV  | IV  | III | II  | II  | .   | +   | .   | +   | II  | r   | .   | V   |  |
| <i>Medicago romanica</i>  | II  | III | .   | .   | .   | 18  | IV  | IV  | IV  | I   | III | III | III | I   | r   | .   | .   |  |
| <i>Artemisia austriaca</i>  | IV  | II  | .   | .   | I   | .   | II  | II  | I   | .   | II  | III | IV  | I   | II  | .   | .   |  |
| <i>Artemisia sericea</i>  | .   | II  | IV  | III | III | II  | V   | IV  | IV  | IV  | II  | .   | +   | +   | I   | I   | IV  |  |

| Number of column   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13 | 14  | 15  | 16 | 17  |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|----|-----|
| <b>D.t. Festucetalia valesiaca</b> and <b>Festuco-Brometea</b> |     |     |     |     |     |     |     |     |     |     |     |     |    |     |     |    |     |
| <i>Galium verum</i>  | II  | V   | V   | V   | III | V   | V   | V   | V   | V   | III | .   | I  | III | I   | IV | V   |
| <i>Stipa capillata</i>   | IV  | II  | r   | II  | I   | II  | IV  | II  | II  | I   | IV  | IV  | IV | III | IV  | II | .   |
| <i>Veronica spicata</i>  | .   | II  | V   | V   | II  | I   | IV  | IV  | IV  | IV  | IV  | III | II | IV  | IV  | V  | V   |
| <i>Festuca valesiaca</i>                                       | III | II  | r   | I   | r   | .   | I   | I   | +   | II  | I   | .   | I  | III | II  | V  | .   |
| <i>Koeleria cristata</i>                                       | V   | III | .   | .   | .   | .   | IV  | II  | II  | .   | III | III | IV | II  | III | .  | .   |
| <i>Campanula sibirica</i>                                      | .   | I   | .   | r   | .   | .   | II  | r   | II  | III | IV  | III | II | II  | V   | II | III |
| <i>Phleum phleoides</i>  | .   | II  | IV  | II  | +   | +   | V   | IV  | V   | V   | II  | .   | +  | II  | +   | I  | .   |
| <i>Filipendula vulgaris</i>                                    | .   | II  | V   | IV  | III | III | V   | V   | V   | V   | III | .   | I  | r   | II  | I  | II  |
| <i>Seseli libanotis</i>  | +   | II  | V   | III | III | III | III | IV  | IV  | IV  | II  | +   | .  | II  | II  | II | I   |
| <i>Plantago urvillei</i>                                       | +   | II  | .   | .   | .   | .   | IV  | V   | IV  | III | III | II  | +  | .   | .   | .  | .   |
| <i>Fragaria viridis</i>  | .   | +   | III | r   | IV  | V   | V   | IV  | V   | V   | III | +   | I  | r   | II  | .  | III |
| <i>Amoria montana</i>  | .   | r   | .   | .   | .   | .   | IV  | III | IV  | V   | II  | .   | .  | .   | I   | .  | .   |
| <i>Potentilla impolita</i>                                     | .   | I   | .   | .   | r   | .   | III | III | IV  | V   | I   | .   | +  | I   | I   | .  | I   |
| <i>Phlomis tuberosa</i>  | II  | II  | II  | r   | V   | V   | IV  | IV  | IV  | IV  | II  | .   | .  | r   | I   | .  | +   |
| <i>Trommsdorffia maculata</i>                                  | .   | II  | r   | .   | .   | .   | IV  | IV  | III | IV  | II  | .   | +  | r   | +   | .  | .   |
| <i>Centaurea scabiosa</i>                                      | +   | +   | .   | .   | r   | I   | III | III | IV  | V   | I   | .   | .  | r   | +   | .  | .   |
| <i>Poa angustifolia</i>  | .   | r   | I   | r   | I   | II  | II  | III | III | IV  | II  | .   | .  | .   | II  | .  | .   |
| <b>D.t. Molinio-Arrhenatheretea</b>                            |     |     |     |     |     |     |     |     |     |     |     |     |    |     |     |    |     |
| <i>Elytrigia repens</i>  | I   | .   | II  | II  | II  | IV  | IV  | III | III | IV  | III | II  | II | r   | II  | .  | .   |
| <i>Achillea millefolium</i>                                    | .   | r   | IV  | I   | III | II  | III | III | II  | IV  | II  | .   | .  | r   | I   | r  | .   |
| <i>Ranunculus polyanthemos</i>                                 | .   | .   | .   | .   | .   | .   | II  | III | II  | V   | +   | .   | .  | .   | .   | .  | .   |
| <i>Bromopsis inermis</i>                                       | +   | +   | .   | .   | II  | II  | II  | II  | I   | II  | I   | .   | +  | .   | .   | .  | .   |
| <b>D.t. Trifolio-Geranietea</b>                                |     |     |     |     |     |     |     |     |     |     |     |     |    |     |     |    |     |
| <i>Genista tinctoria</i>                                       | .   | +   | .   | .   | r   | I   | IV  | III | III | III | I   | .   | .  | r   | II  | .  | .   |
| <i>Origanum vulgare</i>  | .   | .   | II  | +   | II  | II  | I   | II  | III | III | I   | .   | .  | .   | II  | .  | IV  |
| <i>Veronica teucrium</i>                                       | .   | r   | .   | .   | +   | +   | +   | II  | II  | IV  | r   | .   | .  | .   | .   | .  | .   |
| <b>Other species</b>   |     |     |     |     |     |     |     |     |     |     |     |     |    |     |     |    |     |
| <i>Gypsophila altissima</i>                                    | +   | II  | r   | .   | .   | .   | IV  | III | IV  | I   | IV  | III | II | II  | V   | II | V   |
| <i>Vincetoxicum albowanum</i>                                  | .   | I   | I   | III | II  | I   | II  | II  | II  | II  | II  | II  | +  | IV  | IV  | I  | V   |
| <i>Thalictrum minus</i>  | .   | I   | .   | .   | III | IV  | IV  | III | IV  | V   | IV  | III | II | r   | IV  | .  | .   |
| <i>Chamaecytisus ruthenicus</i>                                | +   | III | IV  | IV  | I   | II  | III | IV  | III | IV  | II  | .   | .  | II  | I   | IV | V   |
| <i>Aconogonon alpinum</i>                                      | .   | I   | V   | V   | IV  | III | II  | II  | III | II  | r   | .   | .  | +   | .   | II | .   |
| <i>Pulsatilla patens</i>                                       | .   | III | III | +   | I   | .   | III | III | III | II  | I   | .   | .  | II  | II  | .  | II  |
| <i>Galium tinctorium</i>                                       | +   | +   | r   | .   | I   | II  | IV  | III | III | IV  | III | I   | +  | r   | III | .  | II  |
| <i>Achillea nobilis</i>  | III | III | .   | .   | I   | .   | IV  | II  | II  | I   | I   | +   | I  | I   | .   | .  | .   |
| <i>Silene chlorantha</i>                                       | .   | II  | .   | .   | .   | .   | III | II  | I   | .   | I   | .   | I  | +   | .   | .  | .   |
| <i>Scorzonera purpurea</i>                                     | .   | II  | .   | .   | .   | .   | IV  | III | III | III | II  | .   | I  | r   | +   | .  | .   |
| <i>Galium boreale</i>  | .   | +   | r   | .   | +   | III | III | III | III | V   | II  | .   | .  | I   | III | .  | .   |

1. *Artemisia austriaca*-*Stipetum lessingiana*
2. *Stipetum rubentis*
3. *Myosotido popovii*-*Festucetum rupicola*
4. *Caragano fruticis*-*Stipetum pennatae*
5. *Spiraeo hypericifolia*-*Amygdaletum nanae*
6. *Spiraeo crenati*-*Caraganetum frutex*
7. *Amorio montani*-*Stipetum zaleskii*
8. *Galio veri*-*Stipetum tirsae*
9. *Poa angustifolia*-*Stipetum pennatae*

10. *Leucanthemo vulgaris*-*Stipetum pennatae*
11. *Astragalo austriaca*-*Stipetum pulcherrimae*
12. *Hedysaro grandiflori*-*Stipetum pulcherrimae*
13. *Salvio nutans*-*Stipetum korshinskyi*
14. *Diantho acicularis*-*Orostachietum spinosae*
15. *Stipo pennate*-*Centauretum sibiricae*
16. *Koelerio sclerophyllae*-*Festucetum valesiaca*
17. *Centaureo ibiricae*-*Poetum transbaicalicae*

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