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28

CLASSIFICATION OF CONTINENTAL HEMIBOREAL FORESTS OF NORTH ASIA

Nikolai Ermakov, Julian Dring and John Rodwell

CAMERINO
2000

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BRAUN-BLANQUETIA

Un héritage est enrichissant et ouvre de nouvelles possibilités créatrices. Mais il en découle en contre partie l'obligation de ne pas gaspiller le patrimoine reçu. Ceux qui, aujourd'hui étudient la végétation grâce à la phytosociologie peuvent utiliser des méthodologies bien au point et tirer profit d'un ensemble cohérent de connaisances.
C'est le résultat du travail méthodique de nombreux chercheurs de qualité pendant plusieurs décennies. Aujourd'hui, nous nous trouvons face à des problèmes qui ne sont sans doute pas tout à fait nouveaux mais qui paraissent infiniment plus graves que dans le passé: primauté de la technique, spécialisation, pénurie de matières premières, d'énergie et d'espace, crise de l'environnement...
Il se développe ainsi des problèmes spécifiques divers pour lesquels il est nécessaire de trouver des réponses nouvelles. Les chercheurs sont placés devant un véritable défi et il dépend de leur savoir et de leur imagination de montrer si la Science de la végétation est capable d'apporter une contribution appréciable à la solution de ces problèmes.
La tradition phytosociologique dans ce contexte constitue une base essentielle. La conception typologique de la végétation et la clarté du système qui en découle, l'habitude des chercheurs de vivre en contact étroit avec la végétation, les recherches basées sur l'observation condition antithétique de l'expérimentation, sont les traits caractéristiques de la phytosociologie.
Les lignes directrices qui nous ont été transmises par les maîtres de la Science de la végétation, Josias Braun-Blanquet et Reinhold Tüxen avant tout, constituent actuellement une part importante de notre patrimoine d'idées. Notre but est de valoriser cet héritage et d'honorer la mémoire du premier de ces maîtres et fondateur de la phytosociologie moderne par une nouvelle série de publications.
Pourront y trouver place des monographies étudiant concrètement la végétation selon les enseignements de J. Braun-Blanquet et R. Tüxen qui, à travers la créativité des auteurs, produiront de nouveaux fruits.
Disciples nous-mêmes de J. Braun-Blanquet et ayant collaboré à son activité, nous pensons qu'à travers cette série de publications son héritage restera vivant dans l'esprit originel et avec de nouvelles idées.

Sécretaria

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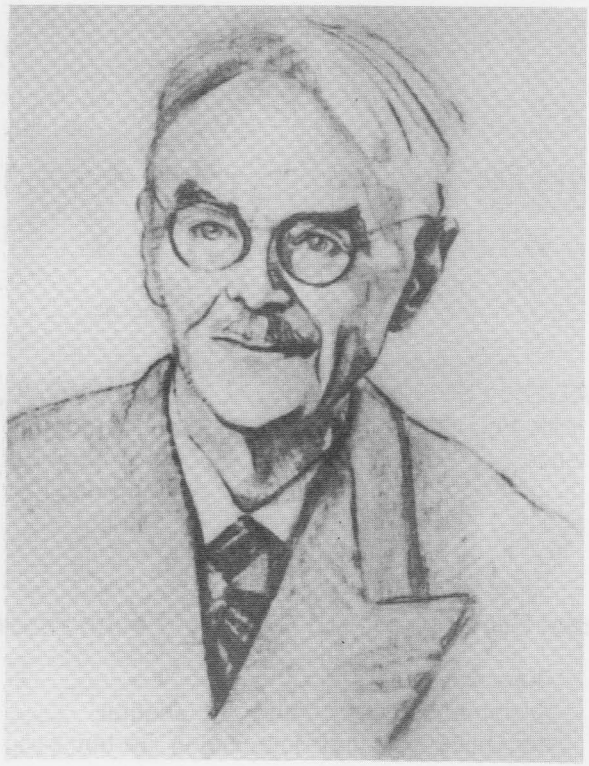

J. BRAUN-BLANQUET, 1954

Drawn from a photograph by Françoise M. Dansereau

INTRODUCTION

Contemporary vegetation science and ecology are connected with such general problems as global changes of climate and the conservation of biodiversity. Therefore, elaboration of vegetation classifications at the continental scale and understanding the relationship of syntaxonomic units to environmental factors is critical. A system of classification of vegetation by the Braun-Blanquet method is a highly developed approach for the study of diversity and laws of vegetation formation. However, this method is as yet rarely applied for solving problems of global ecology and estimating biodiversity on a continental scale. The majority of developed schemes of zonal types of vegetation, small scale geobotanical maps and forecast models are based on ecological-physiognomical and dominant units of vegetation (BOX, 1981; PRENTICE *et al.,* 1992; MONSERUD *et al.*, 1993; TCHEBAKOVA *et al.*, 1994; NAZIMOVA, POLICARPOV, 1996). One of the main reasons for this is the unavailability of a developed system of classification of the vegetation by the Braun-Blanquet method of both Eurasia as a whole and particular transcontinental zonal types.

A monographic review of higher syntaxonomic units is one of the important lines of activity of the Working Group of the International Association for Vegetation Science devoted to the European Vegetation Survey (MUCINA *et al.,* 1993; RODWELL, 1995; MUCINA, 1997). An intensive implementation of the Braun-Blanquet method in the vast territory of Eastern Europe within the framework of this Working Group is desirable for gaining an overview of some higher syntaxonomic units and certain zonal types of Eurasian vegetation. The latter is the more pressing as it allows identification of a variety of higher syntaxonomic units which reflect differentiation of sectors of vegetation within a concrete transcontinental zone. Such units are of great interest for syntaxonomy and geography of vegetation as they are based on two global geographic factors: zonality and oceanity/continentality. One of the first and the most prominent examples of such a sector differentiation is found in two classes of forests of the temperate zone (MEUSEL *et al.*, 1965, 1978): the class *Querco-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937 which unites broad-leaved and coniferous-broad-leaved forests of Europe and the class *Fagetea crenatae* Miyawaki, Ohba et Murase 1964 which unites those temperate forests of East Asia, which are their zonal analogues. The forests of these vicarious classes were formed under the influence of oceanic and suboceanic types of climate controlled by the two world oceans.

The goal of the present work is a review of the classification and the ecological-geographical basis of higher syntaxonomical units of the zonal continental hemiboreal forests of North Asia. These forests, in consequence of an increased continentality of climate replace sub-atlantic and sub-pacific broad-leaved forests in the south of the forest zone and in the forest-steppe zone of Siberia and Mongolia (fig. 1). Between the longitudes 57-130° E continental hemiboreal forests, like their broad-leaved counterparts, present a remarkable example of sectoral differences connected with sub-latitudinal differentiation of Eurasian climate and with floras and vegetation of varying origin.

A complete system of classification of the forests based on both a reassessment of an earlier regional classification and an analysis of new data is presented.

ZONAL FEATURES OF HEMIBOREAL FORESTS

Hemiboreal forests in North Eurasia are the intermediate zonal type between true boreal forests (taiga) and temperate broad-leaved forests as well as between the boreal and the forest-steppe zones in the relatively narrow geographical subzone between the latitudes 52° and 58° N.

The term "hemiboreal forest" has been taken from AHTI *et al.* (1968) who classified the European forests of the southern part of the boreal zone as a peculiar geographic type. Later, HAMET-AHTI (1981), singled out a subzone of circum-hemiboreal forests in the territory of both continents of the North Hemisphere. Similarly, in the works of Russian geobotanists, forests of the southern part of the forest zone are seen as belonging to a special subtaiga subzone (BUKS *et al.*, 1977; SOCHAVA, 1979; GRIBOVA and ISATCHENKO, 1979).

The reason for the classification of these forests as a boreal type of vegetation is the dominance in the woody layer of few but widespread boreal coniferous and small-leaved deciduous species. They form physiognomically similar communities in the vast area of North Eurasia, causing an impression of syntaxonomic uniformity of the forests of this region. Nevertheless, there are significant phytosociological and floristic distinctions between hemiboreal forests and typical boreal (taiga) communities. The former are characterised by a leading phytosociological role of species typical of the vegetation of temperate zone in the composition of herbaceous layer. This peculiarity was shown in the scheme of plant-geographical zones of Eurasia (MEUSEL *et al.*, 1965, 1978). According to this scheme, the subzone of hemiboreal forests was included in the temperate transcontinantal zone.

The difficulty of estimating the zonal location of the hemiboreal forests reflects their transitional character, as well as floristic dissimilarity over the vast Eurasian area with its different sectoral geographical types. Within the subatlantic European part of the area extending to the Urals, they are a transitional zonal type between broad-leaved and coniferous taiga communities. Similarly, in the sub-Pacific part of the area, hemiboreal (and orohemiboreal) forests also form a kind of subzone between broad-leaved and coniferous taiga forests. Completely different laws of distribution and floristic peculiarities are observed in hemiboreal forests in the continental part of Eurasia, from the Urals in the west to the Greater Khingan Mountains (Da Hinggan Ling) in the east. Here, they form a southern peripheral forest zone in contact with steppe as well as being a component of the temperate forest-steppe zone. In the latter case, they represent zonal analogues of broad-leaved forests, replacing them in conditions of increased climatic continentality of Central Eurasia at the same latitudes. Similarly, in the mountain systems of South Siberia and North Mongolia, orohemiboreal forests are a component of the lower part of the forest belt and that of mountain forest-steppe. Continental hemiboreal forests in the main part of their vast range extend across the largest mountain systems of North Eurasia: the South Urals, Altai, Sayani, Transbaical mountains, Khangai, Khentei, Grater Khingan and low mountains of Middle Siberian Plateau (fig. 1). These mountain systems determine variation in the macro- and meso-climates in their different sectors as well as large geographical and plant-geographical boundaries of Eurasia - between Europe and Asia, North and Central Asia, North and East Asia. The majority of the orohemiboreal forests found as components of the mountain forest-steppe occur at a varying range of altitudes: 250-1200 m in semi-humid temperate-continental

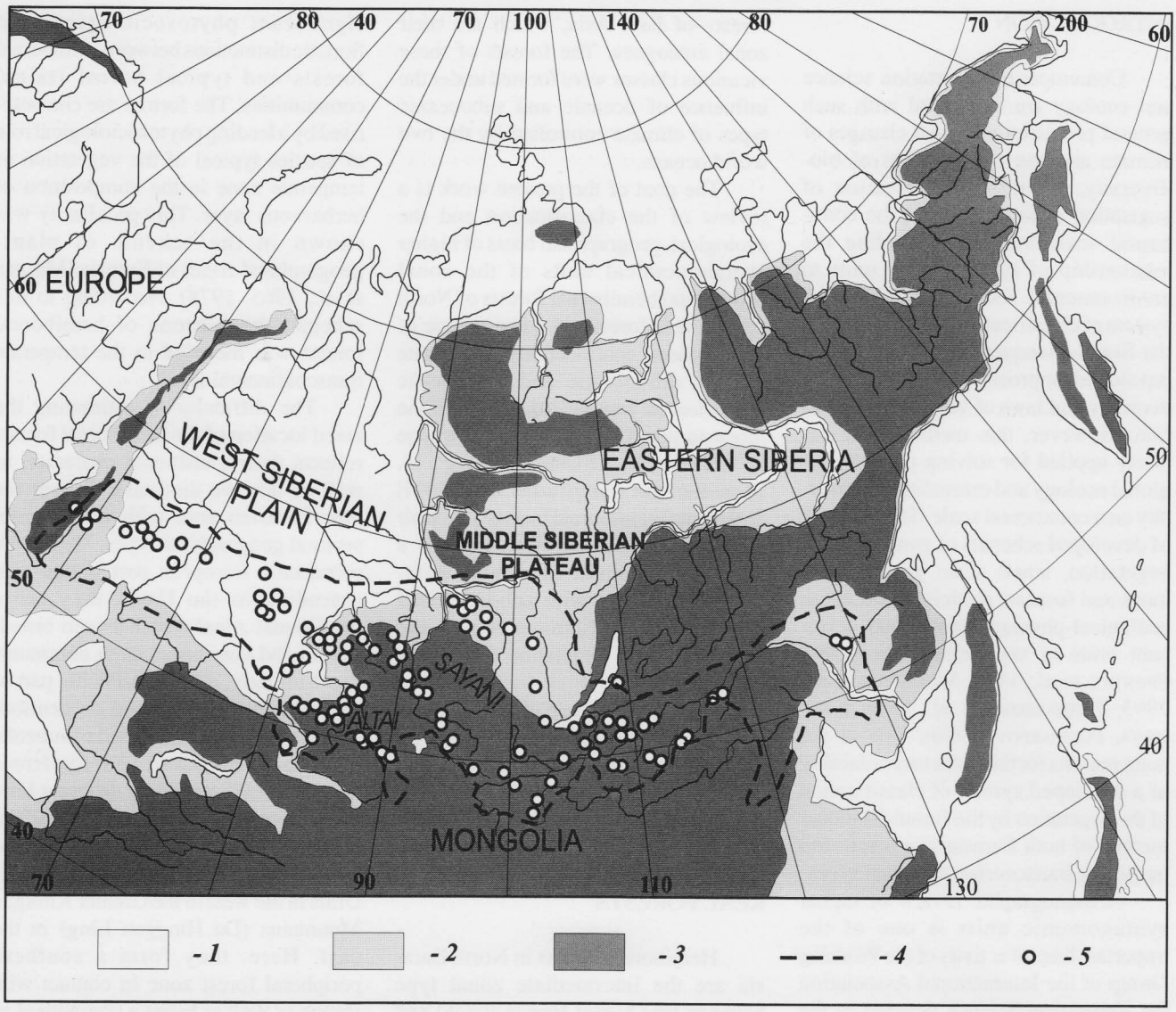

Fig. 1 — Extent of hemiboreal forests and locations of relevés. *1* - Plains and lowlands (altitudes of 10-200 m); *2* - Lower plateaus and elevated plains (altitudes of 200-800 m); *3* - Plateaus and mountains (altitudes of 800-4000 m); *4* - Extent of continental hemiboreal forests; *5* - Location of all relevés of hemiboreal forests.

climate and 1400-2600 m in semi-arid ultra-continental one. There they inhabit the mesic sites of shaded slopes and are replaced by steppes on the more xeric southern slopes. The only exceptions are the orohemiboreal small-leaved-coniferous mixed forests of the hyper-humid sectors of Altai and Sayani, which dominate in the lower part of the forest belt on the slopes of different aspects. Continental hemiboreal forests show one common ecological peculiarity over their vast area: everywhere they occupy the warmest sites in landscapes which are available for supporting the forest vegetation types.

Distribution of hemiboreal forests is not limited by particular soil characteristics. They grow both on rich loamy soils and poor sandy, stony soils developed from chloride slates, carbonates, sandstones, granites as well as alluvial and fluvio-glacial parent materials.

Continental hemiboreal forests form a relatively continuous geographical subzone only in the territory of the West Siberian Plain between latitudes of 49° 50' N and 52° 17' N. There they occur in flat drained watersheds on widespread zonal grey loamy soils or on knolls of the boggy areas. Southwards, in the forest-steppe zone of the West-Siberian Plain, the hemiboreal forests are replaced by meadow-steppes in the flat and convex parts of watersheds. There they occupy the numerous moist and moderately moist small shallow depressions and are a component of the special type of so-named "West-Siberian kolok forest-steppe". The southern most hemiboreal forests occur in the zone of dry steppes of North Kazakhstan. These are azonal psammophilous and petrophilous pine forests forming isolated forest areas on the sandy river terraces, fluvio-glacial deposits and lower granite mountains.

The moderately cold continental climate in the central part of Eurasia promotes the formation of substantial ecological, phytosociological and floristic distinctions between continental small-leaved, coniferous and mixed hemiboreal forests and their suboceanic analogues.

The woody layers of the continental hemiboreal forests are often monodominant or formed of few species with a large ecological amplitude which can survive in extreme climates: *Pinus sylvestris, Betula pendula, B. platyphylla, Larix sibirica, L. gmelinii.* North Asian *Betula pendula* and *Pinus sylvestris* forests, unlike their European analogues are primary zonal communities and grow on zonal grey and dark-grey loamy soils.

High fertility of the soils and good light penetration due to poor closure of the canopy promote a luxuriant development of the herbaceous layer. It characteristically has 60-90% cover, height up to 1.5-1.8 m, rich assemblages of 40-90 species per 200 m^2 and a structural subdivision into several sublayers. This distinct phytocoenotic feature provides the basis for the Russian synonym of the term "hemiboreal forest" – namely, "grass forest". It points to the key physiognomic difference between the Siberian grass forests and widespread typical coniferous taiga.

The principal peculiarity of the herbaceous layer of the widespread types of continental hemiboreal forests lies in the fact that it is formed mainly of species which are not true forest plants. They are, in fact, light-demanding, mesophilous and meso-xerophilous species of meadows, steppes, forest edges, subalpine meadows, high mountains, as well as species without definite phytosociological adaptation to particular habitats (forest-grassland, forest-steppe, meadow-steppe species). Typical shade taiga species do not play any significant part in the composition of the vegetation.

Thermophilous nemoral species are not characteristic either for most of the communities of continental hemiboreal forests. In the territory of Southern Siberia, these species are relic plants with disjunctive ranges. Concentration of nemoral species (including single broad-leaved tree species like *Tilia cordata* subsp. *sibirica*) is shown only in Siberian relic small-leaved dark-coniferous subnemoral forests which are locally widespread in the warmest part in Siberia - the hyper-humid foothills of the Altai and Sayani.

A further important phytocoenotic peculiarity of the majority of continental hemiboreal forests is the absence of moss and lichen layers. The exception is provided by communities of ultra-continental larch forests of Mongolia ("pseudotaiga forests"). What they have in common is a layer of xerophilous moss species which do not play a significant role in the communities of the true taiga, but nevertheless characterize some physiognomic similarity of this zonal forest type.

SYNTAXONOMIC STUDIES

The first studies on the classification of Asian hemiboreal forests with the using the Braun-Blanquet method were carried out in the territory of Mongolia (HILBIG, KNAPP, 1983; PACINA, 1986; MIRKIN *et al.*, 1988; HILBIG, 1990, 1996). The authors did not set themselves the task of developing a complete forest classification. They simply restricted themselves to singling out associations and smaller units and to an analysis of the peculiarities of their floristic composition and ecology. Nevertheless, in these first works it was already noted that Mongolian larch grass forests differed significantly from the widespread coniferous taiga forests of the *Vaccinio-Piceetea* Br.-Bl., Siss. et Vlieger 1939 and did not have any analogues among the higher vegetation units of Europe. Later syntaxonomic studies of hemiboreal forests were conducted in certain regions of South Siberia and the Urals. Denisova (in ILJINA *et al.*, 1988), described 4 associations and an alliance of flood-plain grass forests of the Irtysh river. DYMINA (1989), described the associations of birch and pine-birch forests of the south-eastern part of the West Siberian Plain. FYODOROV (1991), described pine grass forests as an alliance of the South Urals. The authors of these works emphasized a high degree of distictiveness among the they syntaxa described, but actually placed them in the class *Querco-Fagetea* on the basis of the presence of a single diagnostic species of this class and of common widespread European-Siberian species.

At the next stage of the development of the syntaxonomy of Siberian forests, there were various attempts to reflect the phytosociological peculiarities of these forests at the level of higher units of vegetation of Eurasia.

The first attempt to describe a separate class *Irido-Laricetea sibiricae* Zhitlukhina et Mirkin 1987 nom. nud. of hemiboreal forests was made in an invalidly published work of ZHITLUKHINA, MIRKIN (1987), dedicated to larch forests of the Sayano-Shushensky Nature Reserve (West Sayan). When describing this class, the authors followed the concept whereby higher syntaxonomic units could be singled out by physiognomic features of vegetation, without detailed determination and analysis of the floristic composition. As a result, the associations described by them, including listed types, turned out to be transitional variants of taiga forests of the class *Vaccinio-Piceetea*. Incomplete floristic composition and wrong determination of important diagnostic taxa made an identification of their exact syntaxonomic position difficult in subsequent analysis.

Altaian small-leaved dark-coniferous subnemoral relic forests were also included in the class *Milio-Abietetea sibiricae* Zhitlukhina 1988 with its single order *Milio-Abietetalia* Zhitlukhina 1988 and alliance *Milio-Abietion* Zhitlukhina 1988. The main reasons for the description of this new class were the physiognomic peculiarities of these communities:

- the predominance of Siberian dark-coniferous species (*Abies sibirica* and *Pinus sibirica*);
- the absence of broad-leaved trees in the canopies and of characteristic species of the class *Vaccinio-Piceetea* in composition of grass and moss layers;
- the essential phytocoenotic role of tall herb subalpine-forest species.

At the same time, the important feature of Altaian subnemoral forests, namely the essential phytosociological role of European-Siberian *Fagetalia* species was not taken into account. In the subsequent studies of MIRKIN *et al.* (1989) and ERMAKOV (1995), the alliance *Milio-Abietion* was transferred to the order *Fagetalia sylvaticae* (class *Querco-Fagetea*). Later, this alliance was included in the special suborder *Abietenalia sibiricae* Ermakov 1995 of the order *Fagetalia*.

Further studies of the syntaxonomy of hemiboreal forests of North Asia were carried out by various Siberian phytosociologists ERMAKOV *et al.* (1991, 1992, 1997); LASHCHINSKY, REVYAKINA (1992), KOROLYUK (1993), TARAN (1993), ERMAKOV (1994, 1995a, 1995b, 1996a, 1996b,1997); KOROTKOV, ERMAKOV (1999). A distinguishing feature of these studies was the use of data from extensive geographical areas for classification.

The basis for syntaxonomic study was a detailed floristic analysis and plant-geographical comparisons. As a result, a concept of new three classes of hemiboreal forests of North Asia was developed: *Brachypodio pinnati-Betuletea pendulae* Ermakov, Korolyuk et Lashchinsky 1991, *Querco mongolicae-Betuletea davuricae* Ermakov et Petelin 1997, *Rhytidio rugosi-Laricetea sibiricae* K. Korotkov et Ermakov 1999. These classes and widespread European-Siberian ones: *Querco-Fagetea* and *Pulsatillo-Pinetea* include all diversity of the hemiboreal forests in the inner continental part of North Eurasia.

DATA AND METHODS

The work for this study was done in three phases.

1. Creation of a hemiboreal forest data base. 2. Classification of forests using the Braun-Blanquet approach in conjunction with the program TWIN-

SPAN (HILL, 1979). 3. Identification of the plant communities in relation to formal phytosociological syntaxa.

Data assembly

The basis for the analysis was 1580 relevés of hemiboreal forests of the South Urals, West Siberian Plain, Middle-Siberian Plateau, the Altai-Sayani, Transbaikal, Khangai and Khentei (Hentiyn Nuruu) mountain systems (North Mongolia) and the Daurian region (fig. 1).

The relevés form a continuous data series being from all geographical sectors of the region covering the vast area of the hemiboreal zone of Siberia and Mongolia. Since 1984, most of the relevéés have been collected by the lead author (N. Ermakov) during expeditions organized by the Central Siberian Botanical Garden of the Russian Academy of Sciences. Other relevés were collected by E. Lapshina, Yu. Maskayev, G. Pavlova, N. Vodopyanova, A. Kuminova, I. Korotkov, A. Korolyuk, T. Maltseva, N. Makunina or were already in the Central Siberian Botanical Gardern database. Additional information was included in the study from various publications (KAMENETSKAYA *et al.*, 1963; PACINA, 1986; ZHITLUKHINA, MIRKIN, 1987; ILJINA *et al.*, 1988; DYMINA, 1989; HILBIG, 1990, 1996; FALINSKI, 1990, 1995a, 1995b; ERMAKOV *et al.*, 1991, 1992; FEDOROV, 1991; SOLOMESHCH *et al.*, 1993).

All relevés were input into a database using the TURBOVEG software (HENNEKENS, 1996).

Species names follow the list of vascular plants of the former USSR (CHEREPANOV, 1995) and the check-list of mosses of the former USSR (IGNATOV and AFONINA, 1992).

Classification of the hemiboreal forests was refined out using the Braun-Blanquet approach according to WESTHOFF and VAN DER MAAREL, 1973 and Code of phytosociological nomenclature (BARKMAN *et al.*, 1986). Units of hemiboreal forests were singled out on the basis of leading criteria - floristic and phytocoenotic - the former criterion having a decisive role as it reflects the most substantial vegetation characteristics.

Classification

The use of the TURBOVEG and MegaTab packages for database management and for quantitative treatment of a large number of relevés made it possible to develop a classification and to perform a syntaxonomic analysis of hemiboreal forests on the basis of substantial quantities of both new and published data. As a consequence, an integrated system of classification was developed which combined existing regional systems and particular syntaxa. In the process of this research, the need to reconsider diagnostic features of some units singled out earlier, as well as relevéés of new syntaxa, became clear.

The classification was executed in two stages. In the first stage, all relevés from each of geographical regions were processed separately. In this way, small informal groups (phytocoenones) were identified at a fine ecological-topographical scale. 143 groups were identified at this level. In the second stage, the phytocoenones from all regions were analyzed together and the syntaxonomic analysis and characterization of the units were carried out using the available syntaxonomical literature. At this stage, the synoptic tables from regional literature sources were added.

In the second stage, the full synoptic table of low-level syntaxa (variants, subassociations and associations) of hemiboreal forests were used synthesis of the higher level units. MegaTab and TWINSPAN were applied again for elucidation of the floristic integrity of the higher level syntaxa (from suballiances to classes) and for more precise definition of the diagnostic features of the syntaxa.

For description of the syntaxa, the diagnostic species were used in sense of WESTHOFF and VAN DER MAAREL (1973): character-species, differential-species and constant companions. We avoided separating the characteristic species (character-species) into a discrete group because there are still only few data on the ecology, distribution and phytocoenotic position of the species of the vast territory of North Asia. Nevertheless, an attempt at recognizing characteristic species and diagnostic species groups at the level of higher units (classes) has been made. These are important plant geographical and phytocoenotic groups which highlight the peculiarities of hemiboreal forests in relation to climate and the genesis of the Eurasian flora.

The traditional ecological, phytogeographic and phytosociological regional species groups (ideas widely used in phytosociology) were used for the characterization of the ecology and distribution of the syntaxa.

The ecological groups are distinguished by species related to moisture (xerophytes, meso-xerophytes, xero-mesophytes, mesophytes, gygro-mesophytes, meso-gygrophytes, gygrophytes), warmth (thermophytes, moderate thermophytes, moderate cryophytes, cryophytes), fertility of the soils and peculiarities of bedrocks (petrophytes, obligate petrophytes, facultative petrophytes, psammophytes, oligotrophic, oligo-mesotrophic, mesotrophic, megatrophic species).

Phytocoenotic groups correspond to large zonal vegetation types (steppe, meadow-steppe, nemoral, south-boreal, boreal (taiga), subalpine-forest, high-mountain tundra species).

The chorological groups (table I) were used for elucidation of geographical relations of hemiboreal forest types.

Data on the distribution of species were taken from different Floras (Flora of the USSR 1934-1960; Flora of Siberia 1988-1996; Flora of Russian Far East 1985-1996), as well as from MEUSEL *et al.*, 1965, 1978.

Unfortunately, the majority of hemiboreal forest syntaxa were published in almost inaccessible regional and invalid sources.

For completed validization of these syntaxa, the nomenclatural types of some associations and subassociations are represented here together with the synoptic tables.

For characterization of the syntaxa, the old Braun-Blanquet scale (r, +, 1, 2, 3, 4, 5) and constancy scale: + (1-10%), I (11-20%), II (21- 40%), III (41- 60%), IV (61-80%), V (81-100%) were used.

The abbreviations in the tables appended to the species names refer to the structural role of the plants: t1 = tree layer, t2 = second tree layer, s1 = first shrub layer, s2 = second shrub layer, hl = herb layer, ml = ground layer.

MAJOR VARIATIONS AMONG THE HEMIBOREAL FORESTS

The concept of the higher units of hemiboreal forests is based on the significance of the oceanity-continentality factor for geographic and syntaxonomic differentiation of Eurasian vegetation. This macroclimatic factor, together with climatic zonality, influences not only the current character of continental vegetation, but is also the most important factor with regard to its genesis.

The analysis of published syntaxonomic works and new data show that Eurasian hemiboreal forests can be referred to six classes: *Querco-Fagetea*, *Fagetea crenatae*, *Pulsatillo-Pinetea*, *Brachypodio pinnati-Betuletea pendu-*

Table I — Plant geographical (chorological) groups of species of North Asian hemiboreal forests.

Plant geographical groups (types)	Regions	Examples
Holarctic	Non-tropical parts of Eurasia and North America	*Trientalis europaea*
Eurasian	Europe and non-tropical parts of Asia	*Galium boreale*
European	Europe and Urals	*Stachys officinalis*
European-Siberian	Area eastward from Europe as far as East Sayani (sometimes Lake Baikal)	*Angelica sylvestris*
Europe-Siberian disjunctive	Area eastward from Europe as far as East Sayani (sometimes Baikal Region) but with some interruptions in West Siberian lowlands	*Asarum europaeum*
Europe-West Siberian	Eastwards from Europe as far as the eastern part of West Siberian Plain	*Aegopodium podagraria*
East-European-West-Siberian	Eastern part of Europe and West Siberia	*Adenophora liliifolia*
West Palaearctic	Western part of Eurasia	*Gentiana fischeri*
North Asian	North Asia	*Heracleum dissectum*
Asian	Non-tropical part of Asia	*Poa sibirica*
Manchurian-Daurian	Continental part of Eastern Asia	*Iris uniflora*
South-Siberian-Manchurian-Daurian	Continental part of Eastern Asia and southern part of Siberia	*Vicia unijuga*
Daurian	South-eastern part of Eastern Siberia - Dauria	*Saussurea elongata*
South-Siberian-Mongolian	Mountain systems of South Siberia and North Mongolia	*Crepis lyratha*
Eastern-Asian	South-eastern part of Asia	*Quercus mongolica*

lae, *Querco mongolicae-Betuletea davuricae*, and *Rhytidio rugosi-Laricetea sibiricae*. The first two classes include just hemiboreal forests that are only partly suboceanic in character like the mainly broad-leaved forests of the temperate zone. The third class includes southern azonal hemiboreal forest occurring both in the suboceanic climate of Central and Eastern Europe and in the continental climate of the West Siberia and Kazakhstan: these show features of weak continentality. The other three classes described from the territory of South Siberia, North Mongolia and Manchurian-Daurian region contain the continental hemiboreal forests proper.

The ranges of the higher units of zonal hemiboreal forests form two relatively symmetric sets, within which these units replace each other depending on the distance from the Atlantic and the Pacific. These sets comprise vicariants which are physiognomically similar but different in important floristic and phytosociological characteristics. The ecological basis for the physiognomic similarity of these vicarious units is the occurrence of some common adaptive characteristics resulting from the augmentation of continentality and aridity of climate from the Atlantic and the Pacific oceans to the center of the continent:

1. An increase of xeromorphism among the dominant species of the tree layers: broad-leaved species small-leaved and light-coniferous evergreen ones light-coniferous deciduous ones.

2. An impoverishment of number of woody species and simplification of the structure of tree layers: from broad-leaved and coniferous-broad-leaved forests rich in tree species and with many strata to monodominant light-coniferous forests with a single tree layer.

3. A thinning of canopies: from closed suboceanic communities to open continental larch forests.

4. An increase in the role of xerophytic and cryophytic species in the grass layer and decrease in the role of thermophilous and temperate-thermophilous mesophytes.

5. An increased ability for co-occurrence of species of different ecology (xerophytes and mesophytes) in the same communities under the intensification of climatic continentality.

Such common physiognomic characteristics as these express themselves in these communities among different floras - the European-Siberian and the Eastern-Asian so the forests in fact appear very diverse.

The majority of the zonal hemiboreal forests of the sub-Atlantic sector can be referred to the class *Querco-Fagetea*. These are northern broad-leaved and coniferous broad-leaved forests of Scandinavia (KIELLAND-LUND, 1981; DICMANN, 1994), coniferous broad-leaved and nemoral dark-coniferous forests of the Russian Plain (KOROTKOV, 1991) and the Southern Urals (SOLOMESHCH, 1993). Within the class, they can be placed in the order *Fagetalia sylvaticae* Pawłowski in Pawłowski, Sokolowski et Wallisch 1928.

Towards the center of Eurasia, these sub-Atlantic mixed hemiboreal forests of the *Querco-Fagetea* are replaced by the West-Siberian amphi-Atlantic

small-leaved light-coniferous hemiboreal forests of the *Brachypodio pinnati-Betuletea*. The Southern Urals form a major plant - geographical border in the zonal distribution of forests of these classes. All European broad-leaved species except for *Tilia cordata* reach their eastern limits there: *Quercus robur, Acer platanoides, Ulmus glabra, U. laevis*. To the east of the Southern Urals, there are a few nemoral grass and shrub species, which have relic disjunctive ranges extending into the territory of Siberia. Nevertheless, West Siberian small-leaved light-coniferous hemiboreal forests still show close plant geographical connections with European vegetation. Thus, light-demanding, mesophilous and xero-mesophilous species of European classes play the leading phytosociological role in their composition (*Trifolio-Geranietea* Th. Muller 1961, *Molinio-Arrhenatheretea* R. Tx. 1937, *Festuco-Brometea* Br.-Bl. et Tx. 1943, *Mulgedio-Aconitetea* Hadac et Klika in Klika et Hadac 1944). The co-occurrence of these species of different ecology is the result of the intensification of climatic continentality to the east of the Urals. The change of climatic conditions results in a shift in the ecological amplitudes of species and as a consequence leads to radically different phytosociological interrelations.

The disruption of the geographical regularity of global replacement of the *Querco-Fagetea* forests by *Brachypodio-Betuletea* forests in the continental climate of West Siberia is observed only in the north-eastern foothills of the Altai and Sayani. Here, the relic Siberian subnemoral *Fagetalia* forests occur in isolation from the main European part of their range area (ERMAKOV, 1998). The occurrence of these forests in the inner regions of the continent is conditioned by the barrier which the western high ridges of the Altai and Sayani put in the way of Atlantic air masses. This results in the formation of a local weak-continental moderately warm humid (and hypr-humid) mesoclimate.

Similar geographic patterns in the replacement of higher units, one by another, exist in the amphi-Pacific climatic sector. Eastern-Asian broad-leaved dark-coniferous hemiboreal forests of two orders in the Fagetea crenatae (the *Schisandro-Pinetalia koraiensis* Gumarova 1993 and *Rhododendro-Quercetalia mongolicae* Kim 1990) are the vicariants of the European hemiboreal forests of the *Fagetalia*. In the suboceanic climate of the Far East, they extend to the zone of taiga coniferous forests in the north and occur at higher altitudes. The Greater Khingan mountain system (analogous to the Urals) is the major plant geographical border which limits the extent of most of the Eastern-Asian species of the mesophilous nemoral flora and communities of the class *Fagetea crenatae*. Amphi-Pacific light-coniferous small-leaved forests with Mongolian oak and the birches *Betula platyphylla* and *B. davurica* (the class *Querco mongolicae-Betuletea davuricae*) are widespread to the west of the Greater Khingan. Light-demanding mesophilous and meso-xerophilous species of meadows, forest margins and certain species of mesophilous variants of steppes of Eastern-Asian classes play the leading phytosociological role in these forests (*Calamagrostietea langsdorffii* Mirkin in Akhtyamov *et al.* 1985 and *Cleistogenetea squarrosae* Mirkin *et al.* 1986). As a result, the forests of the *Brachypodio-Betuletea* and *Querco-Betuletea davuricae* are physiognomically similar in the make-up of life forms of their species. However, as with the *Querco-Fagetea* and *Fagetea crenatae*, the important differences between them are due to the fact that they are connected historically with different centers of a mesophilous flora: European and Eastern Asian ones. Besides, there are no examples of the *Fagetea crenatae* forests located in the inner continental regions as with the relic Altaian *Fagetalia sylvaticae* stands. This is explained by the weaker influence of the Pacific ocean on the climate of the inner parts of Eurasia compared with the influence of the Atlantic as well as by the essential distinctness of amphi-Pacific and amphi-Atlantic climate regimes.

The communities of the class *Rhytidio rugosi-Laricetea* are the extreme continental element of this sequence where both the sequences converge. In the territory of North Mongolia and adjacent mountain systems of Southern Siberia, they replace the forests of the classes *Brachypodio-Betuletea* and *Quercetea mongolicae-Betuletea davuricae* in ultracontinental cryo-arid climatic conditions. However, the *Rhytidio-Laricetea* forests are not really transitional communities between these two classes: they exhibit their own peculiar characters of ecology, phytocoenotic structure and floristic composition. These are dominantly light coniferous grass and moss-grass forests dominated by *Larix sibirica*.

The main peculiarity of their floristic composition is the great number of Eurasian and Asian meso-xerophilous and xerophilous steppe species of the class *Cleistogenetea squarrosae* and cryophilous species of dry high mountain meadows of the class *Carici rupestris-Kobresietea bellardii* Ohba 1974. Moreover, in these forests there are none of the mesophilous temperate-thermophilous European-Siberian and Eastern-Asian species, which are typical of hemiboreal forests of the amphi-Atlantic and amphi-Pacific sectors.

The forests of the *Rhytidio-Laricetea* are the typical extreme communities formed at the limit of existence of forest vegetation in the ultracontinental climate of Central Asia. They have developed in the active contact zone of different types of vegetation: of forest, steppe and high mountain.

The dendrogram for 62 associations of zonal continental hemiboreal forests (fig. 2) clearly demonstrates the floristic integrity of the main higher units of the North Asian forests and floristic relations between them. Three distinct association groups characterized by the largest linkage distances are seen and these represent the classes.

Associations of the *Brachypodio pinnati-Betuletea pendulae* and *Querco mongolicae-Betuletea davuricae* form two extreme branches of the dendrogram with the contrasting European-West-Siberian and Eastern-Asian floras. The distinction between the groups is high, despite the fact that the classes have a common geographical border in the southern part of the Transbaikal Mts and transitional communities (association 61 of the dendrogram).

Associations of the class *Rhytidio-Laricetea* occupy the central part of the dendrogram. They form a discrete branch of the diagram but demonstrate greater similarity with the associations of the *Querco mongolicae-Betuletea davuricae* than those of the *Brachypodio-Betuletea*. The similarity demonstrates the asymmetry of the floristic relationships of hemiboreal forests of the central part of continent. The greater floristic closeness of the *Rhytidio-Laricetea* communities to the Eastern-Asian hemiboreal forests than to European-West-Siberian ones is observed.

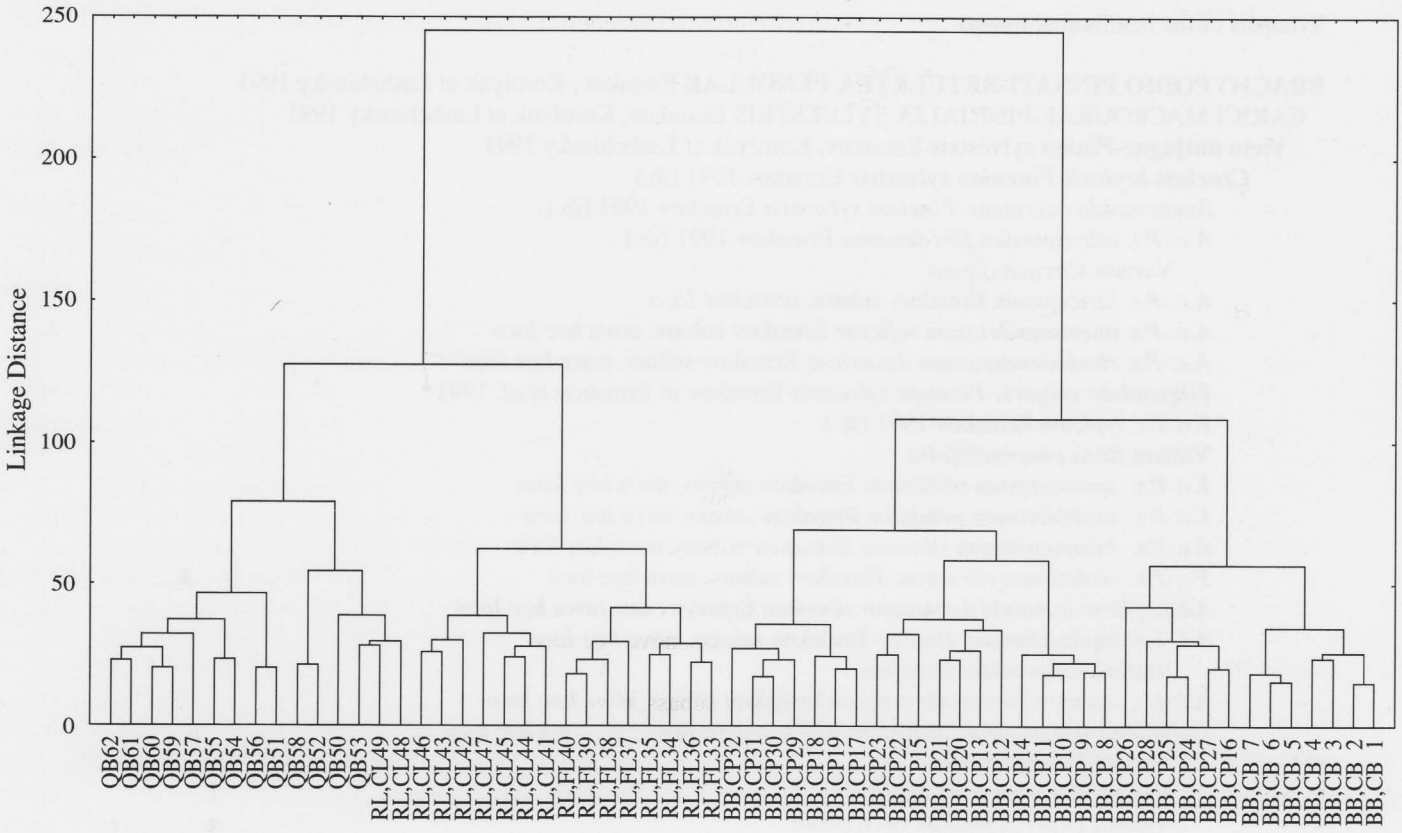

Fig. 2 — Tree Diagram for 62 associations of hemiboreal forests (Ward's method, Euclidean distances): QB – class *Querco mongolicae-Betuletea davuricae*, order *Querco mongolicae-Betuletalia davuricae*; RL,CL – class *Rhytidio rugosi-Laricetea sibiricae*, order *Carici pediformis-Laricetalia sibiricae*; RL,FL – class *Rhytidio rugosi-Laricetea sibiricae*, order *Festuco ovinae-Laricetalia sibiricae*; BB,CP – class *Brachypodio pinnati-Betuletea pendulae*, order *Carici macrourae-Pinetalia sylvaticae*; BB,CB – class *Brachypodio pinnati-Betuletea pendulae*, order *Calamagrostio epigei-Betuletalia pendulae*.

1-62 – the associations: 1 - *Peucedano morisonii-Betuletum pendulae*, 2 - *Carici praecocis-Betuletum pendulae*, 3 - *Caragano arborescentis-Pinetum sylvestris*, 4 - *Equiseto hyemalis-Pinetum sylvestris*, 5 - *Poo urssulensis-Betuletum pendulae*, 6 - *Phalaroido-Betuletum pendulae*, 7 - *Cirsio heterophylli-Betuletum pendulae*, 8 - *Geranio albiflori-Pinetum sylvestris*, 9 - *Atrageno sibiricae-Pinetum sylvestris*, 10 - *Dryopterido expansae-Pinetum sylvestris*, 11 - *Dentario sibiricae-Pinetum sylvestris*, 12 - *Saussureo parviflorae-Laricetum sibiricae*, 13 - *Polygonato humilis-Betuletum pendulae*, 14 - *Brunnero sibiricae-Pinetum sylvestris*, 15 - *Paeonio anomalae-Laricetum sibiricae*, 16 - *Trollio asiaticae-Populetum tremulae*, 17 - *Matteuccio-Pinetum sylvestris*, 18 - *Spiraeo salicifoliae-Pinetum sylvestris*, 19 - *Duschekio fruticosae-Pinetum sylvestris*, 20 - *Anemonoido caeruleae-Pinetum sylvestris*, 21 - *Filipendulo vulgaris-Pinetum sylvestris*, 22 - *Adenophoro lamarcki-Laricetum sibiricae*, 23 - *Calamagrostio pavlovi-Laricetum sibiricae*, 24 - *Artemisio latifoliae-Betuletum pendulae*, 25 - *Calamagrostio arundinaceae-Betuletum pendulae*, 26 - *Roso spinosissimae-Pinetum sylvestris*, 27 - *Astragalo glycyphylli-Pinetum sylvestris*, 28 - *Cnidio dubii-Pinetum sylvestris*, 29 - *Festuco ovinae-Pinetum sylvestris*, 30 - *Crepido praemorsae-Pinetum sylvestris*, 31 - *Thesio repentis-Pinetum sylvestris*, 32 - *Geranio vlassowiani-Pinetum sylvestris*, 33 - *Thesio repentis-Laricetum sibiricae*, 34 - *Kobresio myosuroidis-Laricetum sibiricae*, 35 - *Spiraeo chamaedryfoliae-Laricetum sibiricae*, 36 - *Festuco altaicae-Laricetum sibiricae*, 37 - *Poo sibiricae-Laricetum sibiricae*, 38 - *Vicio unijugae-Laricetum sibiricae*, 39 - *Betulo platyphyllae-Populetum tremulae*, 40 - *Geranio pseudosibiricae-Laricetum sibiricae*, 41 - *Kitagawio baicalensis-Pinetum sylvestris*, 42 - *Patrinio sibiricae-Pinetum sylvestris*, 43 - *Carici pediformis-Laricetum sibiricae*, 44 - *Colurio-Laricetum sibiricae*, 45 - *Anemono sylvestris-Laricetum sibiricae*, 46 - *Primulo cortusoidis-Laricetum sibiricae*, 47 - *Cotoneastero uniflori-Laricetum sibiricae*, 48 - *Lespedezo junceae-Pinetum sylvestris*, 49 - *Pulsatillo turczaninovii-Pinetum sylvestris*, 50 - *Artemisio desertorum-Betuletum davuricae*, 51 - *Geranio davurici-Betuletum davuricae*, 52 - *Carici vanheurcki-Betuletum davuricae*, 53 - *Oxytropido myriophyllae-Pinetum sylvestris*, 54 - *Galatello dahuricae-Betuletum platyphyllae*, 55 - *Bromopsido pumpellianae-Pinetum sylvestris*, 56 - *Veronicastro sibiricae-Betuletum davuricae*, 57 - *Geranio vlassowiani-Laricetum gmelinii*, 58 - *Aquilegio parviflorae-Quercetum mongolicae*, 59 - *Veronico longifoliae-Laricetum gmelinii*, 60 - *Calamagrostio langsdorffii-Betuletum platyphyllae*, 61 - *Vicio venosae-Betuletum platyphyllae*, 62 - *Penthaphylloido fruticosae-Betuletum platyphyllae*.

Synopsis of the hemiboreal forests

BRACHYPODIO PINNATI-BETULETEA PENDULAE Ermakov, Korolyuk et Lashchinsky 1991
CARICI MACROURAE-PINETALIA SYLVESTRIS Ermakov, Korolyuk et Lashchinsky 1991
Vicio unijugae-Pinion sylvestris Ermakov, Korolyuk et Lashchinsky 1991
Cruciato krylovii-Pinenion sylvestris Ermakov 1991 (ib.)
Anemonoido caeruleae-Pinetum sylvestris Ermakov 1991 (ib.)
A.c.-P.s. athyrietosum filix-feminae Ermakov 1991 (ib.)
Variant *Circaea alpina*
A.c.-P.s. laricetosum Ermakov subass. nova *hoc loco*
A.c.-P.s. anemonoidetosum reflexae Ermakov subass. nova *hoc loco*
A.c.-P.s. rhododendretosum davuricae Ermakov subass. nova *hoc loco*
Filipendulo vulgaris-Pinetum sylvestris Ermakov in Ermakov *et al.* 1991
F.v.-P.s. typicum Ermakov 1991 (ib.)
Variant *Rosa pimpinellifolia*
F.v.-P.s. spiraeetosum trilobatae Ermakov subass. nova *hoc loco*
F.v.-P.s. arabidetosum pendulae Ermakov subass. nova *hoc loco*
F.v.-P.s. brunneretosum sibiricae Ermakov subass. nova *hoc loco*
F.v.-P.s. violetosum arenariae Ermakov subass. nova *hoc loco*
Adenophoro lamarcki-Laricetum sibiricae Ermakov ass. nova *hoc loco*
A.l.-L.s. ligularietosum glaucae Ermakov subass. nova *hoc loco*
Variant *Filipendula stepposa*
A.l.-L.s. anemonastretosum crinitae Ermakov subass. nova *hoc loco*
Calamagrostio pavlovi-Laricetum sibiricae Ermakov ass. nova *hoc loco*
Variant *Spiraea media*
Variant *Bergenia crassifolia*
Variant *Dracocephalum ruyschiana*
Variant *Allium microdictyon*
Vicio unijugae-Pinenion sylvestris Korolyuk in Ermakov *et al.* 1991
Artemisio latifoliae-Betuletum pendulae Ermakov, Makunina et Maltseva ex *hoc loco*
A.l.-B.p. ligularietosum glauci Ermakov, Makunina et Maltseva ex *hoc loco*
A.l.-B.p. typicum Ermakov, Makunina et Maltseva ex *hoc loco*
A.l.-B.p. pinetosum sylvestris prov.
Calamagrostio arundinaceae-Betuletum pendulae Dymina ex *hoc loco*
C.a.-B.p. typicum Ermakov subass. nova *hoc loco*
C.a.-B.p. fragarietosum viridis Ermakov, Makunina et Maltseva ex *hoc loco*
Roso spinosissimae-Pinetum sylvestris Ermakov ass. nova *hoc loco*
Astragalo glycyphylli-Pinetum sylvestris Korolyuk in Ermakov *et al.* 1991
Cnidio dubii-Pinetum sylvestris Lashchinsky 1991 (ib.)
Achyrophoro-Pinenion sylvestris Ermakov et Lashchinsky 1991
Festuco ovinae-Pinetum sylvestris Ermakov 1991 (ib.)
F.o.-P.s. rhododendretosum davuricae Ermakov subass. nova *hoc loco*
F.o.-P.s. vaccinietosum myrtilli Ermakov subass. nova *hoc loco*
F.o.-P.s. typicum Ermakov subass. nova *hoc loco*
Crepido praemorsae-Pinetum sylvestris Ermakov in Ermakov *et al.* 1991
C.p.-P.s. typicum Ermakov 1991 (ib.)
Variant *Hemerocallis minor*
C.p.-P.s. asteretosum tatarici Ermakov subass. nova *hoc loco*
Thesio repentis-Pinetum sylvestris Ermakov in Ermakov *et al.* 1991
Geranio vlassowiani-Pinetum sylvestris Ermakov ass. nova *hoc loco*
G.v.-P.s. geranietosum eriostemonis Ermakov subass. nova *hoc loco*
G.v.-P.s. polemonietosum chinensis Ermakov subass. nova *hoc loco*
Lathyro gmelinii-Pinetalia sylvestris Ermakov in Ermakov *et al.* 1991
Geranio albiflori-Pinenion sylvestris Ermakov 1991 (ib.)
Geranio albiflori-Pinetum sylvestris Ermakov ass. nova *hoc loco*
Atrageno sibiricae-Pinetum sylvestris Ermakov ass. nova *hoc loco*
Dryopterido expansae-Pinetum sylvestris Ermakov *nom. nov.*
Dentario sibiricae-Pinetum sylvestris Ermakov in Ermakov *et al.* 1991
D.s.-P.s. typicum Ermakov subass. nova *hoc loco*
D.s.-P. s. abietetosum sibiricae Ermakov subass. nova *hoc loco*
D.s.-P.s. matteuccietosum Ermakov subass. nova *hoc loco*
Saussureo parviflorae-Laricetum sibiricae Ermakov ass. nova *hoc loco*
Polygonato humilis-Betuletum pendulae Ermakov ass. nova *hoc loco*
Brunnero sibiricae-Pinetum sylvestris Ermakov ass. nova *hoc loco*
B.s.-P.s. typicum Ermakov subass. nova *hoc loco*

B.s.-P.s. equisetosum sylvaticae Ermakov subass. nova *hoc loco*
Paeonio anomalae-Laricetum sibiricae Ermakov ass. nova *hoc loco*
Euphorbio pilosae-Caraganetum arborescentis Lashchinsky et Revyakina 1992 *nom. nud.*
Geranio sylvaticae-Pinenion sylvestris Ermakov suball. nova *hoc loco*
Trollio asiaticae-Populetum tremulae Dymina ex *hoc loco*
Melilotoido platycarpi-Pinetum sylvestris Ermakov ass. nova *hoc loco*
Carici macrourae-Pinenion sylvestris Ermakov in Ermakov *et al.* 1991
Matteuccio-Pinetum sylvestris Ermakov 1991 (ib.)
Spiraeo salicifoliae-Pinetum sylvestris Ermakov 1991 (ib.)
Duschekio fruticosae-Pinetum sylvestris Ermakov ass. nova *hoc loco*
CHAMAECYTISO RUTHENICI-PINETALIA SYLVESTRIS Solomeshch et Ermakov ord. nova *hoc loco*
Veronico teucrii-Pinion sylvestris Ermakov all. nova *hoc loco*
Saussureo controversae-Betuletum pendulae Ermakov ass. nova *hoc loco*
Genisto tinctoriae-Betuletum pendulae Ermakov ass. nova *hoc loco*
Pyrethro corymbosi-Pinetum sylvestris Solomeshch ass. nova *hoc loco*
Calamagrostio arundinaceae-Laricetum sibiricae Schubert, Jäger et Mahn ex Solomeshch ass. nova *hoc loco*
Carici caryophylleae-Pinetum sylvestris Martynenko ass. nova *hoc loco*
Serratulo gmelinii-Betuletum pendulae Solomeshch ass. nova *hoc loco*
Trollio europaei-Pinion sylvestris Fedorov ex Ermakov *hoc loco*
Bupleuro longifoliae-Pinetum sylvestris Fedorov ex *hoc loco*
B.l.-P.s. typicum Fedorov ex *hoc loco*
B.l.-P.s. seselietosum libanotis Fedorov ex *hoc loco*
Myosotido sylvaticae-Pinetum sylvestris Fedorov ex *hoc loco*
CALAMAGROSTIO EPIGEI-BETULETALIA PENDULAE Korolyuk ex *hoc loco*
Peucedano morisonii-Betulion pendulae Ermakov 1996
Peucedano morisoni-Betuletum pendulae Korolyuk ex *hoc loco*
P. m.-B.p. typicum Ermakov subass. nova *hoc loco*
P. m.-B. p. geranietosum pratensis Ermakov subass. nova *hoc loco*
Carici praecocis-Betuletum pendulae Ermakov 1996
C.p.-B.p. typicum Ermakov subass. nova *hoc loco*
C. p.-B. p. vicietosum unijugae Ermakov subass. nova *hoc loco*
C. p.-B.p. cerasetosum fruticosae Ermakov subass. nova *hoc loco*
Caragano arborescentis-Pinetum sylvestris Ermakov ass. nova *hoc loco*
Equiseto hyemalis-Pinetum sylvestris Ermakov, Makunina et Maltseva ex *hoc loco*
E.h -P.s. caraganetosum arborescentis Ermakov subass. nova *hoc loco*
E.h.-P. s. chimaphiletosum Ermakov subass. nova *hoc loco*
E. h.-P.s. caricetosum macrourae Ermakov, Makunina et Maltseva ex *hoc loco*
E.h.-P.s. betuletosum pendulae Ermakov subass. nova *hoc loco*
Calamagrostio epigei-Betulion pendulae Korolyuk ex *hoc loco*
Poo urssulensis-Betuletum pendulae Korolyuk in Ermakov *et al.* 1991 *nom. nud.*
Phalaroido-Betuletum pendulae Korolyuk ex *hoc loco*
Cirsio heterophylli-Betuletum pendulae Korolyuk ex *hoc loco*
C.h.-B.p aegopodietosum podagrariae Korolyuk ex *hoc loco*
C.h.-B.p. galeopsietosum Korolyuk in Ermakov *et al.* 1991 *nom. nud.*
C.h.-B.p. vicietosum sylvaticae Ermakov subass. nova *hoc loco*
QUERCO-FAGETEA Br.-Bl. et Vlieger in Vlieger 1937
FAGETALIA SYLVATICAE Pawł. in Pawł. *et al.* 1928
ABIETENALIA SIBIRICAE Ermakov subord. nova *hoc loco*
Milio effusi-Abietion sibiricae Zhitlukhina ex *hoc loco*
Cruciato krylovii-Abietenion sibiricae Ermakov suball. nova *hoc loco*
Asaro-Abietetum sibiricae Zhitlukhina ex *hoc loco*
Violo biflorae-Abietetum sibiricae Ermakov ass. nova *hoc loco*
Violo uniflorae-Abietetum sibiricae Ermakov ass. nova *hoc loco*
Anemonoido baicalensis-Abietetum sibiricae Ermakov et Stepanov in Ermakov 1995
Milio effusi-Abietenion sibiricae Ermakov suball. nova *hoc loco*
Cacalio hastatae-Abietetum sibiricae Ermakov ass. nova *hoc loco*
Geranio robertiani-Tilietum sibiricae Ermakov et Maskayev in Ermakov 1995
Filipendulo ulmariae-Populion tremulae Ermakov all. nova *hoc loco*
Dactylido-Abietetum sibiricae Ermakov ass. nova *hoc loco*
Festuco giganteae-Populetum tremulae Ermakov ass. nova *hoc loco*
Anemonoido jenisseensis-Populetum tremulae Ermakov 1995
Equiseto pratensis-Padetum Falinski ex *hoc loco*
Geranio sylvatici-Populetum tremulae Ermakov ass. nova *hoc loco*
Saussureo latifoliae-Populetum tremulae Ermakov ass. nova *hoc loco*
PULSATILLO-PINETEA SYLVESTRIS Oberd. 1992
KOELERIO GLAUCAE-PINETALIA SYLVESTRIS Ermakov 1999

Koelerio glaucae-Pinion sylvestris Ermakov 1999
Carici supinae-Pinetum sylvestris Ermakov 1999
C.s.-P.s. typicum Ermakov 1999
C.s.-P.s. caraganetosum arborescentis Ermakov 1999
Artemisio scopariae-Pinetum sylvestris Ermakov 1999
QUERCO MONGOLICAE-BETULETEA DAVURICAE Ermakov et Petelin in Ermakov 1997
QUERCO MONGOLICAE-BETULETALIA DAVURICAE Ermakov 1997
Kitagawio terebinthaceae-Betulion davuricae Ermakov 1997
Paeonio lactiflorae-Betulenion davuricae Ermakov suball. nova *hoc loco*
Artemisio desertorum-Betuletum davuricae Ermakov 1997
Geranio davurici-Betuletum davuricae Ermakov 1997
Variant *Calamagrostis langsdorffii*
Carici vanheurcki-Betuletum davuricae Ermakov et Petelin in Ermakov 1997
Calamagrostio epigei-Pinenion sylvestris Ermakov suball. nova *hoc loco*
Oxytropido myriophyllae-Pinetum sylvestris Ermakov ass. nova *hoc loco*
Galatello dahuricae-Betuletum platyphyllae Ermakov ass. nova *hoc loco*
Bromopsido pumpellianae-Pinetum sylvestris Ermakov ass. nova *hoc loco*
B.p.-P.s. typicum Ermakov subass. nova *hoc loco*
B.p.-P.s. potentilletosum longifoliae Ermakov subass. nova *hoc loco*
B.p.-P.s. vaccinietosum vitis-idaeae Ermakov subass. nova *hoc loco*
Ligulario fischeri-Betulion davuricae Ermakov 1997
Convallario keiskei-Betulenion davuricae Ermakov suball. nova *hoc loco*
Veronicastro sibiricae-Betuletum davuricae Ermakov 1997
Geranio vlassowiani-Laricetum gmelinii Ermakov 1997
Aquilegio parviflorae-Quercetum mongolicae Ermakov et Petelin in Ermakov 1997
Bistorto viviparae-Betulenion platyphyllae Ermakov suball. nova *hoc loco*
Veronico longifoliae-Laricetum gmelinii Ermakov ass. nova *hoc loco*
Calamagrostio langsdorffii-Betuletum platyphyllae Ermakov ass. nova *hoc loco*
C.l.-B.p typicum Ermakov subass. nova *hoc loco*
C.l.-B.p. artemisietosum sericeae Ermakov subass. nova *hoc loco*
Vicio venosae-Betuletum platyphyllae Ermakov ass. nova *hoc loco*
Penthaphylloido fruticosae-Betuletum platyphyllae Ermakov ass. nova *hoc loco*
RHYTIDIO RUGOSI-LARICETEA SIBIRICAE K. Korotkov et Ermakov 1999
FESTUCO OVINAE-LARICETALIA SIBIRICAE I.Korotkov et Ermakov ex *hoc loco*
Irido ruthenicae-Laricion sibiricae Ermakov all. nova *hoc loco*
Thesio repentis-Laricetum sibiricae Ermakov 1996
Th.r.-L.s. typicum Ermakov 1996
Th.r.-L.s. rosetosum pimpinellifoliae Ermakov subass. nova *hoc loco*
Th.r.-L.s. adenophoretosum lamarcki Ermakov subass. nova *hoc loco*
Th.r.-L.s. hedysaretosum neglecti Ermakov subass. nova *hoc loco*
Pachypleuro alpini-Laricion sibiricae Ermakov all. nova *hoc loco*
Kobresio myosuroidis-Laricetum sibiricae Ermakov ass. nova *hoc loco*
K.m.-L.s. typicum Ermakov subass. nova *hoc loco*
K.m.-L.s. dryadetosum oxyodontae Ermakov subass. nova *hoc loco*
K.m.-L.s. hedysaretosum inundati Ermakov subass. nova *hoc loco*
Spiraeo chamaedryfoliae-Laricetum sibiricae Ermakov ass. nova *hoc loco*
S.h.-L.s. cicerbitetosum azureae Ermakov subass. nova *hoc loco*
S.h.-L.s. colurietosum geoidis Ermakov subass. nova *hoc loco*
S.h.-L.s. empetretosum nigri Ermakov subass. nova *hoc loco*
Festuco altaicae-Laricion sibiricae I.Korotkov et Ermakov ex *hoc loco*
Festuco altaicae-Laricenion sibiricae Ermakov suball. nova *hoc loco*
Festuco altaicae-Laricetum sibiricae I.Korotkov et Ermakov ex *hoc loco*
F.a.-L.s. typicum Ermakov subass. nova *hoc loco*
F.a.-L.s. delphinietosum crassifolii Ermakov subass. nova *hoc loco*
Poo sibiricae-Laricetum sibiricae Pacina ex *hoc loco*
Pentaphyllo fruticosae-Laricetum sibiricae Mirkin *et al.* 1986
Fragario orientalis-Laricenion sibiricae Ermakov suball. nova *hoc loco*
Vicio unijugae-Laricetum sibiricae Ermakov, Korotkov et Laletin ex *hoc loco*
Geranio pseudosibiricae-Laricetum sibiricae Hilbig (1987) 1990
G.p.-L.s. aconitetosum barbati Hilbig 1990
Variant *Geranium eriostemon*
Variant *Crepis sibirica*
Variant typical
Variant *Kobresia bellardi*
Variant *Stellaria bungeana*
G.p.-L.s. cacalietosum hastatae Hilbig 1990 (1996)

G.p.-L.s. calthetosum palustris Hilbig 1990 (1996)
Betulo platyphyllae-Populetum tremulae Hilbig 1990 (1996)
Irido-Laricetum sibiricae Mirkin in Mirkin *et al.* 1988
Cypripedio guttati-Pinetum sylvestris Anenkhonov et Ünal in Anenkhonov et Chytrý 1998
Scorzonero radiatae-Pinetum sylvestris Anenkhonov et Ünal in Anenkhonov et Chytrý 1998
CARICI PEDIFORMIS-LARICETALIA SIBIRICAE Ermakov in Ermakov *et al.* 1991
Carici pediformis-Laricion sibiricae Ermakov 1991 (ib.)
Sedo hybridi-Pinenion sylvestris Ermakov suball. nova
Carici pediformis-Laricetum sibiricae Ermakov in Ermakov *et al.* 1991
C.p.-L.s. juniperetosum sabinae Ermakov subass. nova *hoc loco*
C.p.-L.s. typicum Ermakov subass. nova *hoc loco*
C.p.-L.s. youngietosum tenuifoliae Ermakov subass. nova *hoc loco*
C.p.-L.s. neottianthetosum cucullatae Ermakov subass. nova *hoc loco*
Patrinio sibiricae-Pinetum sylvestris Ermakov ass. nova *hoc loco*
Kitagawio baicalensis-Pinetum sylvestris Ermakov ass. nova *hoc loco*
Cotoneastero melanocarpi-Laricenion sibiricae Ermakov suball. nova *hoc loco*
Anemono sylvestris-Laricetum sibiricae Ermakov 1995
Colurio geoidis-Laricetum sibiricae Ermakov ass. nova *hoc loco*
Primulo cortusoidis-Laricetum sibiricae Ermakov ass. nova *hoc loco*
P.c.-L.s. elytrigietosum gmelinii Ermakov subass. nova *hoc loco*
Variant *Adoxa moschatellina*
Variant *Atragene sibirica*
P.c.-L.s. filipenduletosum stepposae Ermakov subass. nova *hoc loco*
P.c.-L.s. betuletosum pendulae Ermakov subass. nova *hoc loco*
P.c.-L.s. festucetosum sibiricae Ermakov subass. nova *hoc loco*
Cotoneastero uniflori-Laricetum sibiricae Ermakov subass. nova *hoc loco*
Pulsatillo turczaninowii-Pinion sylvestris Ermakov all. nova *hoc loco*
Lespedezo junceae-Pinetum sylvestris Ermakov ass. nova *hoc loco*
L.j.-P.s. typicum Ermakov subass. nova *hoc loco*
L.j.-P.s. silenetosum jenisseensis Ermakov subass. nova *hoc loco*
Pulsatillo turczaninovii-Pinetum sylvestris Ermakov ass. nova *hoc loco*

Table II — Diagnostic species (D.S.) of higher units (class-order) of North Asian hemiboreal forests.

Association nr.	1111111111222222222233333333334444444444555555555566666666677 12345678901234567890123456789012345678901234567890123456789012345678901
The main woody species	
Betula pendula	555555555555555544555555555.55315.....252..2.....544532252.1
Pinus sylvestris	..54...55..5245525.225455555.1554.....535....55.251...223.....55
D.S. Cl. *Brachypodio pinnati-Betuletea pendulae*	
Calamagrostis arundinacea	12.5.1355.55342435354.55555355555.....32..1.....
Brachypodium pinnatum	44554355445544355535555255455555.....1..1.....
Iris ruthenica	435342345545334555544525555531.1...555.551.....
Rubus saxatilis	55555555555555555555545555555555.....31.52.13...3..145.4444.....
Serratula coronata	45.3454...242...23133512122.23.....1.....
Pleurospermum uralense	12.342353555514543544335434442 2.4...1.21.....5444.31434113..
Agrimonia pilosa	224421221.4341.123245.5..111433.1.....2.13.121.....22.....
Pulmonaria mollis	23554355355555455555555553455555.5.....11.....33553534..
Angelica sylvestris	11134435455545443312335332524.2.2.....552535554..
Hieracium umbellatum	34.234312..3123133532525545444554.....553..2.125..54515545.....52
Vicia sepium	34355455343555523214414312415241 5.....3....4..
Lilium pilosiusculum	11.42.24444543544355451524344322555.2..11.14115.....2.13.5132.3..
D.S. Cl. *Rhytidio-Laricetea sibiricae*	
Larix sibirica	.....512.3524151...44131..34.55555255425555.....
Rhytidium rugosum	.....111.....1.....55555..5535435352.54.2..1.....
Carex pediformis	.....124.....2.....4541221555555555..52...1232.....
Poa sibirica	.....13524111.525112...214..21.555542533.5433.1...531.5555.....
Aconitum barbatum	.....2.....23542..21423.....4145.444535455..13....3.112.....
Bupleurum multinerve	.....211...1.....3541...554.545.....
Galium verum	544.211.....1...132522...2...521.15415.235455552251132.1.1.1.....2.
Thalictrum foetidum	...2.11.....21511.....1.25313324.255553.....11.....
Aster alpinus	.....12.....1...4.155221245154535 52.53....1.2.....
Pulsatilla patens	.1.2..1.....1.1124215.44542123512411..25554555545.5531.1411.....42
Scorzonera radiata	.....1.114..1...321.....331123235134324.23542.32522.....
Abietinella abietina	.....111.....1.2211.23543...213.32..1.....
Potentilla matsuokana	.....1.....235.5..3.12.23.....
D.S. Cl. *Querco mongolicae-Betuletea davuricae*	
Betula platyphylla	.....5.....52.....453555555555.....
Betula davurica	.....55..5.3.....
Iris uniflora	.....2.....1554555545534.....
Fragaria orientalis	.....4.....42.....255355545555.....
Potentilla fragarioides	...1.....11...12112....1.2.....1.....55555.44235.....
Sedum aizoon	.....111.1....1.1.....3...1..1.3354255525325.....
Astragalus membranaceus	.....1.1.....1..2.....2.41551112424.....
Saussurea elongata	.....2.....235.5555.5544.....
Adenophora tricuspidata	.....1.....1...5.1553.4514.....
Vicia unijuga	.1.2...4..33311235555.551544.....42..2.344.5521.4523.....
Seseli seseloides	.....5.1531.53.5.....
Vicia pseudorobus	.....54.45.5.1.....
Patrinia scabiosifolia	.....52135..51.....
Synurus deltoides	.....51.454455.4.....
Lilium pensylvanicum	.....3.....42.24144345.....
Adenophora sublata	.....41.1452.3.....
Artemisia integrifolia	.....1....111...1....1.....44.25445535.....
Viola dactyloides	.....1.....1.....42125.2.2.1.....
Geranium eriostemon	.....13.....4..555.5545.....
Aster tataricus	.....1.....42455.4431.....
Rosa davurica	.....13154444.2.....
Carex lanceolata	.....54..531.5555.....
Elymus confusus	.....1.....1.2..53..1424.....
Calamagrostis brachytricha	.....51..511.....
Campanula cephalotes	.....5...5....12.....
Adenophora pereskiifolia	.....3..134.21.....
Adenophora coronopifolia	.....1.....113.....1..3..311.23.2.....

Table II (continuation)

Association nr.	111111111122222222223333333333444444444455555555556666666667 12345678901234567890123456789012345678901234567890123456789012345678901
D.S. Ord. *Chamaecytiso ruthenici-Pinetalia sylvestris*	
Chamaecytisus ruthenicus	.....55555.....
Trifolium medium	.....554.3.....
Stachys officinalis	.....555.4.....
Adenophora liliifolia	12.1..1..11.2...21.323.1....55234...1..2.....4.....
Primula macrocalyx	.....21352....535.....11515.....11..2.....
Viola collina	.....4355.....2...4.....
Carex rhizina	.....42412.....
Inula hirta	.....23.2.....
Galium tinctorium	.....553.....
Carex digitata	.....353.....
Veronica chamaedrys	...1....1..22...12.12.....43515.....
Geranium pseudosibiricum	.....11.3..3225551.3..55445545.5314244.51.24.1.....152.....
Veronica spuria	23.111.....4.....22.....
Digitalis grandiflora	.....1414.....
D.S. Ord. *Festuco ovinae-Laricetalia sibiricae*	
Bromopsis pumpelliana	.....3.....1.5.....1..1.....5154143 2.1522.211..211..542.....
Dianthus superbus	..11.....2.1.2113214.11212.....4543..1..1351.....12.....3.
Festuca ovina	.....2.....3212.....4555434.....35..542.5422.....
Trisetum sibiricum	.....12..5231.1341331....112.....42444.2..1..1.....1..125.....
Lonicera altaica	.....1...32.11.....2.1.....3422..11.....
Carex amgunensis	.....2.....113.....3234243 5...5..1.5.2555.5542.....
Bistorta vivipara	.....112.....1.1.....22543.4..1..1.....12...5532.....
D.S. Ord. *Carici pediformis-Laricetalia sibiricae*	
Kitagawia baicalensis	.....1.....1.....12.....55331235.....3.
Vicia nervata	.....123.....1.....3...5.2553253.22.....1.....
Cotoneaster melanocarpus	.1.1...1.....242214.1.1..451.122.2.5155555453.1..1....21.....
Veronica incana	.1.....11.....1.....1.1.1..552333.43.....
Dianthus versicolor	.....1.....1.....4..11.1..233..31311.....21
Schizonepeta multifida	.....11.....1.....1.....3253514 43.21.....
Achnatherum sibiricum	.....11.....1.....21.3.344.542...1.1.....
Koeleria cristata	.....11.1.....1.....52.12.43..51.....1.....
Artemisia gmelinii	.....2..1....1.....1....51.2.4.1331..1.....

Constancy scale: 1 (1-20%), 2 (21-40%), 3 (41-60%), 4 (61-80%), 5 (81-100%)

CONSPECTUS OF HEMIBOREAL FORESTS

BRACHYPODIO PINNATI–BETULETEA PENDULAE Ermakov, Korolyuk et Lashchinsky 1991

Nomenclatural type is the order *Carici macrourae-Pinetalia sylvestris*.

This class includes small-leaved deciduous and small-leaved light coniferous amphi-Atlantic forests of South Siberia, so-called "grass forests", "subtaiga" in Russian. Its range encompasses the southern part of the forest zone (the subtaiga subzone) and forest-steppe zone from the South Urals in the west to Baikal region in the east (fig. 3). This vast territory includes the West Siberian Plain, Middle Siberian Plateau, Altai, Sayani and Ttansbaikal mountain systems. The climate of the area is temperate continental - warm and humid as compared with the rest of territory of North Asia. The annual range of air temperature is -3° - +3° C, the temperature of the coldest month (January) varies from -11 to -22° C, the temperature of the warmest month (July) varies from +16° to +19° C, the characteristic total annual precipitation is 500-900 mm and the Conrad's Continental index is 44-56. These grass forests occur mainly on zonal loamy grey forest soils in the zonal climate conditions.

There are no woody character species in the communities of this class and species with wide ranges like *Betula pendula, Pinus sylvestris, Larix sibirica, Populus tremula* form the tree layer. The first two species are the principal dominants which form mixed tree layers through most of the range. Primary monodominant *Betula pendula* forests are only extensive in the West Siberian Plain; in the rest of the range, birch forests are secondary communities developed after cutting, fires and intensive grazing. The contribution of *Larix sibirica* in the composition increases eastward due to climatic continentally but this species forms monodominant stands in the class very rarely.

The grass forests with predominance of *Larix sibirica* are transitional ones to the *Rhytidio-Laricetea* and they occur only at the south-eastern boundary of the amphi-Atlantic hemiboreal forests. Aspen (*Populus tremula*) contributes and sometimes dominates in the communities in mesic or moist ground conditions. *Picea obovata* and *Pinus sibirica* appear in the tree layer of those communities transitional to the class *Vaccinio-Piceetea* but these species are not typical of the *Brachypodio-Betuletea* forests.

Table II (continuation)

Association nr.	1111111111222222222233333333334444444444555555555566666666677 12345678901234567890123456789012345678901234567890123456789012345678901
D.S. Cl. *Querco-Fagetea*, Ord. *Fagetalia sylvaticae*	
Actaea spicata	.....23.1....
Adoxa moschatellina	.....125222...311.1..1.....11.....1.....223434333..
Anemonoides altaica	.....34.22..411.1....11.11.....1..34555355..
Asarum europaeum	.....1.....551.54.....
Brachypodium sylvaticum	.....1....1.....3512352...
Bromopsis benekenii	.....1.....3.5....
Carex sylvatica	.....4.1.41...
Chrysosplenium alternifolium	.....2.....
Daphne mezereum	.....4....21.....1.....1.....112411.1...
Dryopteris filix-mas	.....21..11....1.....33555444...
Festuca altissima	.....515.4321...
Festuca gigantea	.....2....1..1.....1.....331542..
Galium odoratum	.....1.....225455.....
Geranium robertianum	.....1.....1..41.....
Lonicera xylosteum	.....1.....2.....
Melica nutans	...2..155..5244523123.241244..524.....1.....253..323...
Milium effusum	...1...224.5332321..1..11.1...2.2.....524554545..
Paris quadrifolia	.....1211.1324341.....1.11.....234525.23..
Polystichum braunii	.....21.45.....
Sanicula europaea	.....533.43.....
Scrophularia nodosa	.....11.....1.....3...12..
Stachys sylvatica	.....1.....1.....32443523..
Tilia sibirica	.....5.....
Viburnum opulus	...2..1....32...11..1..1.....4.523514..
Viola mirabilis	11.1..123.4.1...13353..3131.55315.....3...1....
D.S. Cl. *Pulsatillo-Pinetea*	
Veronica spicata	1.....1.1...2.....215.....2.....55
Koeleria glauca	.....3.....45
Carex ericetorum	..12.....1.....45
Silene chlorantha	.....1.....31
Festuca beckeri	35
Artemisia scoparia	35
Silene baschkirorum	.....3.
Gypsophila altissima	.....1.....1.....1..14.3.....42
Gypsophila paniculata	35
Stipa sabuletorum	23
Jurinea cyanoides	23
D.S. Ord. *Calamagrostio epigei-Betuletalia pendulae*	
Calamagrostis epigeios	5553554...2.21...112153112111212.....21..1.241.43....132.....55
Kadenia dubia	5554443.....1.1...5..1.211.....1.....
Poa angustifolia	5533413.....1.44212.1...231.....52
Heracleum sibiricum	43.2543.....441.5.....
Artemisia macrantha	4553343.....111411.2.1...4...312.....12413.....
Geranium bifolium	2414434...2.2.....54.14.....
Tanacetum vulgare	44.1331...1.1.....111.....3.....1.....
Rosa majalis	3545.212..21213112243113111.55551.....2....
Galatella biflora	44.2442.....112215.....2.....
D.S. Ord. *Carici macrourae-Pinetalia sylvestris*	
Carex macroura	...2...552555555554355553555.....2.1.11.....45442.351..
Cimicifuga foetida	.....55353111.43512...1321.....1....11..1.....1.2..1.....
Pteridium aquilinum	.1.3.1145.35432423.23.42134353..1.....1...3.2.1..144315455..
Trollius asiaticus	.....4.5555455514332354355.....1113..2.....14...3..44....
Bupleurum aureum	...1...315355.4.44144555123...4.51.....23..134.1..
Heracleum dissectum	...2...34355433543522442.334.....12.1..1..1..1....1.....112532221534..
Viola uniflora	.....34555454541534.155345.....1.11.....4..5..41..4..
Aconitum volubile	...1..1154443.2.42223122112.....1.....1....123334.4...

The characteristic herbaceous species of the class are North Asian ones: *Pleurospermum uralense, Serratula coronata, Agrimonia pilosa, Lilium pilosiusculum.* The main parts of the geographical ranges and ecological amplitudes of these species coincide with those of the class. Differential species for the class are *Brachypodium pinnatum, Calamagrostis arundinacea, Vicia sepium, Angelica sylvestris* and *Pulmonaria mollis*. These are moderately thermophilous species with a range of the European-Siberian type, the extent of which exceeds that of the class. In Europe, they occur in various forest and nonforest communities. But in the continental climate of South Siberia, a change of ecological peculiarities of the species is observed. As a result, in the eastern part of the range, they have a high degree of fidelity only to the communities of amphi-Atlantic hemiboreal forests. This group of European-Siberian differential species is thus of great diagnostic importance from a geographical point of view and the Siberian parts of the ranges of these species coincide with the distribution of the class because of the coincidence in macroclimatic conditions.

Differential species for the class also are *Rubus saxatilis, Hieracium umbellatum* and *Iris ruthenica*. The first two have Eurasian and Holarctic ranges and occur in the different types of communities there, but in the territory of West and Middle Siberia they grow predominantly in the communities of mesophilous grass forests. The North Asian species *Iris ruthenica* has its phytocoenotic optimum in the mesophilous variants of steppes but it is nevertheless found regularly in the forests of the *Brachypodio-Betuletea*, and here it is of great diagnostic importance.

The local characteristic species of the class is a North Asian one - *Cimicifuga foetida* which is of high fidelity in all its range.

The best overall diagnosis of the class *Brachypodio-Betuletea* results from the analysis of the presence and phytosociological role of diagnostic species of both the class and those of subordinated orders.

The communities of the *Brachypodio-Betuletea* show similarities in their floristic composition with East European and East Ural communities of the class *Querco-Fagetea*, because of the significant phytocoenotic role of European-Siberian and Eurasian species. In some Siberian amphi-Atlantic forests, three characteristic species of this class, *Lathyrus vernus, Viola mirabilis, Melica nutans,* are regularly found. Such species as *Viburnum opulus* and *Epipactis helleborine* are rare. Most of them have disjunct relic ranges in Siberia, which are much less than that of the class *Brachypodio-Betuletea* itself. We consider these species as regional characteristic species of the class *Querco-Fagetea* only in the territory of Europe in oceanic and suboceanic climates.

Most of characteristic species of the *Querco-Fagetea*, especially the broad-leaved woody ones, have the eastern borders of their range at the South Urals and are absent from the territory of North Asia.

In the Southern Urals, at the geographical border between these classes, there is a problem of deciding whether to ascribe some forest communities to the classes *Querco-Fagetea* or *Brachypodio-Betuletea*. The broad-leaved forests of the alliance *Lathyro-Quercion* Solomeshch *et al.* 1989 which have a contribution from numerous Siberian species in the herb layer occur there. In the same region, pine-birch forests of the *Brachypodio pinnati-Betuletea* with a weak participation of some *Querco-Fagetea* diagnostic grass species, are found in the drier sites. In this case, one of the effective criteria for separation of these classes is the significant phytosociological role of broad-leaved tree species and nemoral shrubs.

The absence of diagnostic species of the class *Vaccinio-Piceetea* is characteristic of the majority of communities in the *Brachypodio-Betuletea*. The phytosociological role of some these species *(Vaccinium vitis-idaea, V. myrtillus, Trientalis europaea, Orthilia secunda, Pleurozium schreberi, Hylocomium splendens, Ptilium crista-castrensis*) occurs only in transitional communities as a result of increasing habitat humidity and cold. It is observed in a transitional zonal strip between hemiboreal and real boreal (taiga) forests.

Furthermore, an intensification of the role of taiga species is evident in the hemiboreal forests which grow in the cold and humid depressions of the oligotrophic river terraces in the forest-steppe zone.

In the arid continental climate of intermountain hollows of the Altai and Sayani, there are a series of communities transitional to the class *Rhytidio-Laricetea sibiricae*. In these forests, the role of xerophilous and cryo-xerophilous species such as *Aster alpinus, Carex pediformis, Festuca ovina, Galium verum, Thalictrum foetidum, Veronica incana, Rhytidium rugosum* and *Abietinella abietina* increases.

Meadow species of the class *Molinio-Arrhenatheretea* are also a constant phytosociological element in the *Brachypodio-Betuletea* communities. The prominent role of these species in hemiboreal forests is caused by the influence of natural ecological factors like the temperate warm and humid climate, high soil fertility and the open tree layer as well as of anthropogenic factors such as grazing and cutting.

CARICI MACROURAE–PINETALIA SYLVESTRIS Ermakov, Korolyuk et Lashchinsky 1991

Nomenclatural type is the alliance *Vicio unijugae-Pinion sylvestris.*

The order includes typical communities of amphi-Atlantic hemiboreal forests of South Siberia. These are moderately thermophilous small-leaved light coniferous grass forests of the humid temperate-continental climatic sector of North Asia. They occur on the grey loamy soils of the drained habitats in the forest-steppe zone and in the southern part of forest zone. The range of the order covers the south-eastern part of the West Siberian Plain, the southern part of the Middle Siberian Plateau and the northern part of the Altai-Sayani mountain system.

Differential species of the order belong to the North Asian plant geographical group: *Bupleurum aureum, Heracleum dissectum, Trollius asiaticus* (subalpine-forest species), *Aconitum volubile, Carex macroura, Viola uniflora* (species of hemiboreal and southern boreal forests). There is one characteristic species of the order (and regional characteristic species of the class) - *Cimicifuga foetida*, North Asian plant in its distributions. Another the regional differential species of the order is pluregional *Pteridium aquilinum.*

These species all indicate good moisture and high fertility of soils of the zonal hemiboreal forests habitats. The presence of the diagnostic species combination is a reliable criterion for distinction between communities of this order and hemiboreal forests of poorly drained solodic soils of the West Siberian lowland (the order *Calamagrostio epigei-Betuletalia pendulae*).

The order includes two alliances representing different ecological types of the hemiboreal forests, which are developed in sites with contrasting regimes of soil moisture.

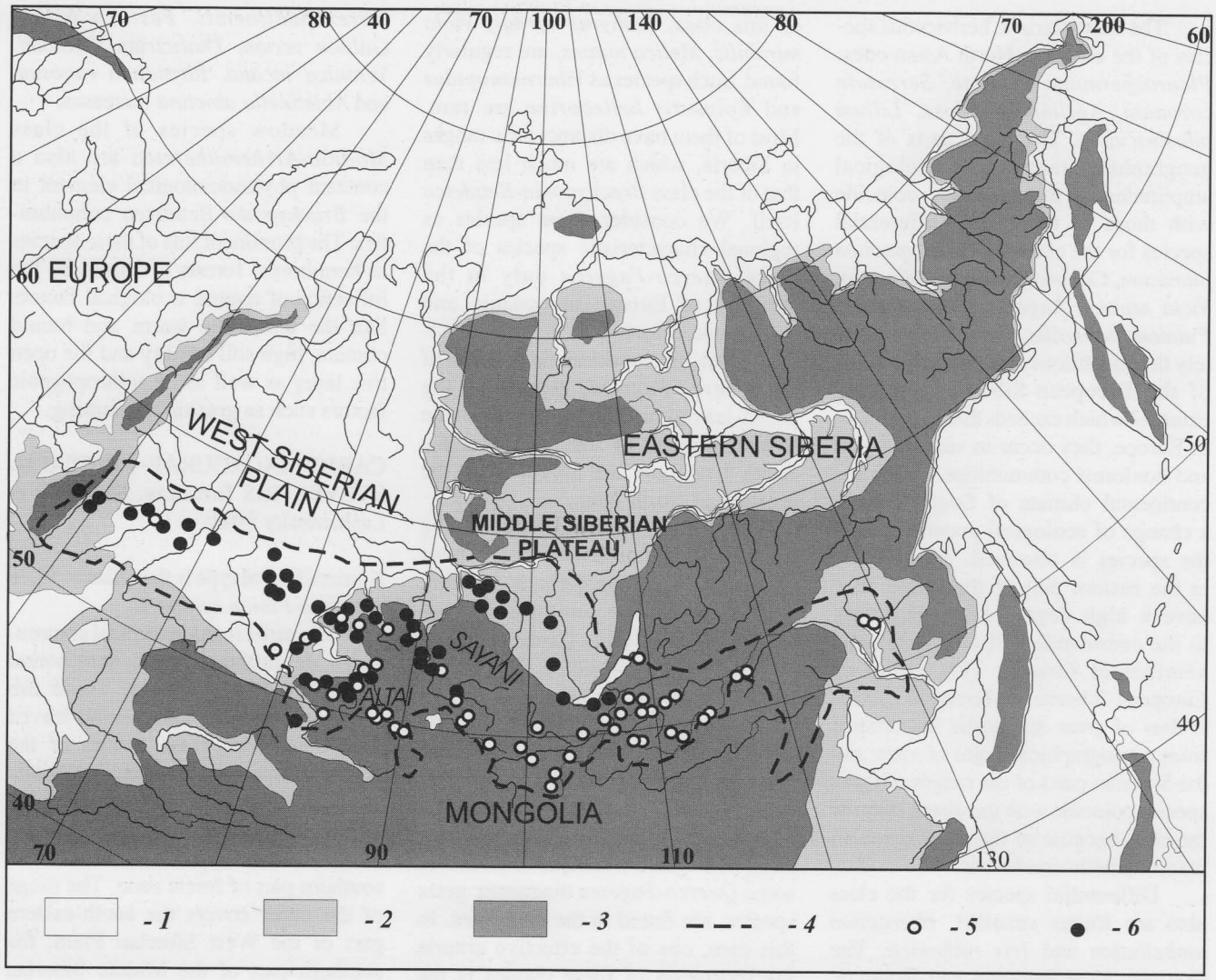

Fig. 3 — Distribution of hemiboreal forests of the class *Brachypodio pinnati-Betuletea pendulae*. *1* - Plains and lowlands (altitudes of 10-200 m); *2* - Lower plateaus and elevated plains (altitudes of 200-800 m); *3* - Plateaus and mountains (altitudes of 800-4000 m); *4* - Extent of hemiboreal forests; *5, 6* - Location of all relevés of hemiboreal forests; *6* - Location of relevés of the class *Brachypodio pinnati-Betuletea pendulae*.

Vicio unijugae-Pinion sylvestris Ermakov, Korolyuk et Lashchinsky 1991
(Tables III, IV)

Nomenclatural type is the association *Thesio repentis-Pinetum sylvestris*.

Pine-birch (*Pinus sylvestris, Betula pendula*) grass forests formed in moderately moist, moderately dry and periodically dry sites. This moisture regime is typical of zonal habitats of the southern part of the forest and forest-steppe zones. The alliance also includes some azonal petrophytic and psammophytic types of hemiboreal forests occurring on steep mountain slopes and higher river terraces.

The group of diagnostic species consists of xero-mesophytes (*Lupinaster pentaphyllus, Lathyrus pisiformis, Inula salicina, Saussurea controversa*) and moderate mesophytes avoiding wet sites (*Vicia unijuga, Aquilegia sibirica, Geranium pseudosibiricum, Ptarmica impatiens*). The group is not uniform from a plant geographical point of view. Nevertheless, the species are important ecological indicators of soil moisture which is not excessive.

The alliance includes three sub-alliances representing hemiboreal forests of different orographic regions of South Siberia: elevated drained plains of West Siberia, the Middle Siberian Plateau, and the Altai-Sayani mountain system. Each of the orographic regions is characterised by unique meso-climatic, geomorphologic and soil conditions, causing essential distinctions in the floristic composition of the forests.

Cruciato krylovii-Pinenion sylvestris Ermakov in Ermakov *et al.* 1991
(Table III: *1 - 19*)

Nomenclatural type is the association *Anemonoido caeruleae-Pinetum sylvestris*.

Mesophytic mountain hemiboreal forests of the Altai and Sayani. They form the lower part of the forests belt and are a component of forest-steppe one at altitudes of 300-1400 m.

The group of diagnostic species includes Altai-Sayanian endemics (*Erythronium sibiricum, Cruciata krylovii, Lathyrus frolovii, Aconitum krylovii*) and species of the European-Siberian disjunctive ranges (*Spiraea chamaedryfolia, Primula macrocalyx*). They occur in Siberia only in the Altai and Sayani mountains and indicate the temperate climate continentality of the range of the suballiance. Besides, the species are not regional characteristic ones of the higher units, as they grow both in the grass forests and in the communities of some mountain boreal

forests (*Vaccinio-Piceetea*), meadows (*Molinio-Arrhenatheretea*).
Descriptions of the forest types equivalent to this suballiance are found in the Siberian geobotanical literature: BESKRESTNOVA (1955); KUMINOVA (1960); KRYLOV (1963, 1984); RECHAN, KRYLOV (1963); MASKAYEV (1985).

Anemonoido caeruleae-Pinetum sylvestris Ermakov 1991 (ib.), 1995
(Table III: *1 - 5*)

Diagnostic species: *Aegopodium alpestre, Bistorta major, Cacalia hastata, Cerastium pauciflorum, Geranium albiflorum, Lathyrus gmelinii, Polemonium coeruleum, Ranunculus monophyllus, R. grandifolius, Senecio nemorensis.*

These are mesophilous and moderately thermophilous birch-pine and birch-larch mixed grass forests occurring in the cyclonic and temperate continental sectors of the Altai and Sayani. They occupy northern slopes with the mesic and moderately mesic grey loamy soils on the chloride slate bedrock at altitudes of 350-1200 m.

Anemonoido caeruleae-Pinetum sylvestris athyrietosum filix-feminae Ermakov 1991 (ib.)
(Table III: *1, 2*)

Diagnostic species: *Anemonoides caerulea, Athyrium filix-femina, Equisetum pratense, Adenophora liliifolia, Filipendula ulmaria, Potentilla fragarioides, Cypripedium macranthon.*

Birch-pine forests of warm, humid lower mountains of the North Altai. They occupy gentle slopes and higher terraces of river valleys at altitudes of 350-600 m.

Variant *Circaea alpina* (Table III: *1*) includes forests of more shadowed moist sites.

Anemonoido caeruleae-Pinetum sylvestris laricetosum sibiricae Ermakov subass. nova hoc loco
(Table III: *3*)

Nom. type is relevé nr. 1, Table XIII.
Diagnostic species: *Anthriscus sylvestris, Adonis sibirica, Bromopsis inermis, Carex humilis, Elymus komarovii, E. mutabilis, Geranium pratense, Paeonia anomala, Poa urssulensis.*

Mixed larch-birch forests (sometimes larch or birch forests) of the temperate - continental sector of the North and Central Altai. They occupy northern slopes with moderately mesic rich soils at altitudes of 600-1200 m.

Anemonoido caeruleae-Pinetum sylvestris anemonoidetosum reflexae Ermakov subass. nova hoc loco
(Table III: *4*)

Nom. type is relevé 2, Table XIII.
Diagnostic species: *Anemonoides reflexa, Adenophora lamarckii, Anemonastrum crinitum.*

Thermophilous mixed birch-pine forests of the foot-hills of the West Sayani on mesic soils.

Anemonoido caeruleae-Pinetum sylvestris rhododendretosum davuricae Ermakov subass. nova hoc loco
(Table III: *5*)

Nom. type is relevé 3, Table XIII.
Diagnostic species: *Rhododendron dauricum, Anthoxanthum odoratum, Campanula altaica, Vaccinium myrtillus, Viola biflora.*

Petrophilous pine forests of the North Altai and Sayani with a well-developed shrub layer. They occupy sites with exposed bedrock or with rocky soils.

Filipendulo vulgaris-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table III: *6-11*)

Nom. type is relevé 7, Table XIII.
Diagnostic species: *Artemisia sericea, Filipendula vulgaris, Fragaria viridis, Galium verum, Origanum vulgare, Peucedanum morisonii, Polygonatum odoratum, Viola hirta.*

These are moderately thermophilous xero-mesophytic pine forests of the cyclonic climatic sector of the Altai and Sayani. They are a component of thermophilous mountain forest-steppe and occupy the eastern, western and sometimes southern slopes with immature soils at altitudes of 600-1000 m. These forests are replaced by communities of previous association in the sunless parts of slopes with more developed mesic soils.

Filipendulo vulgaris-Pinetum sylvestris typicum Ermakov subass. nova hoc loco
(Table III: *6*)

Nom. type is relevé 7, Table XIII.
Diagnostic species are those of the association.
Typical community of the association.

Variant *Rosa pimpinellifolia* (Table III: *7*) represents geographical variant of the subassociation from the foot-hills of the West Altai.

Filipendulo vulgaris-Pinetum sylvestris spiraeetosum trilobatae Ermakov subass. nova hoc loco
(Table III: *8*)

Nom. type is relevé 22, Table XIII.
Diagnostic species: *Spiraea trilobata, Artemisia gmelinii, Bupleurum multinerve, Elymus gmelinii, Galium paniculatum, Kitagawia baicalensis, Sedum hybridum, Veronica krylovii, Woodsia ilvensis.*

Xero-mesophytic pine forests of the Altai with petrophilous steppe species. They occupy southern slopes in the cyclone sector of the Altai and anticipate the forest-steppe belt there.

Filipendulo vulgaris-Pinetum sylvestris arabidetosum pendulae Ermakov subass. nova hoc loco
(Table III: *9*)

Nom. type is relevé nr. 4, Table XIII.
Diagnostic species: *Arabis pendula, Carex humilis, Elymus caninus, E. komarovii, E. mutabilis, Galatella macrosciadia, Geranium pratense, Geum aleppicum, Hypericum hirsutum, Lithospermum officinale, Paeonia anomala, Poa urssulensis, Ribes hispidulum, Valeriana alternifolia.*

Xero-mesophytic larch forests of intermountain hollows of the Central Altai.

Filipendulo vulgaris-Pinetum sylvestris brunneretosum sibiricae Ermakov subass. nova hoc loco
(Table III: *10*)

Nom. type is relevé nr. 5, Table XIII.
Diagnostic species: *Brunnera sibirica, Lysimachia vulgaris, Vicia sylvatica.*

Mesophytic pine forests of the foot-hills of the West Sayani. They occupy the middle and upper parts of shaded slopes with well-developed mesic grey loamy soils.

Filipendulo vulgaris-Pinetum sylvestris violetosum arenariae Ermakov subass. nova hoc loco
(Table III: *11*)

Nom. type is relevé nr. 6, Table XIII.
Diagnostic species: *Astragalus danicus, Bupleurum scorzonerifolium, Carex obtusata, Hemerocallis minor, Hylotelephium triphyllum, Hypericum perforatum, Viola arenaria.*

Xero-mesophytic pine forests of the northern part of the Western Sayani. They occur on southern steep slopes of foot-hills of the West Sayani at altitudes 300-600 m.

Adenophoro lamarcki-Laricetum sibiricae Ermakov ass. nova hoc loco (Table III: *12-14*)

Nom. type is relevé nr. 8, Table XIII.
Diagnostic species: *Adenophora coronopifolia, A. lamarckii, Anemone sylvestris, Artemisia tanacetifolia, Crepis praemorsa, Cypripedium macranthon, Gentiana macrophylla, Hedysarum neglectum, Malaxis monophyllos, Primula cortusoides, Thalictrum foetidum, Seseli libanotis, Scorzonera radiata, Zigadenus sibiricus.*

These are primary birch-larch mixed forests and secondary birch ones occurring in the forest-steppe belt of the eastern macroslope of the Kuznetski Alatau ridge, in temperate continental climate. They occupy northern slopes with moderately mesic soils at altitudes of 400-1200 m. Some intensification of the climate continentality of the association range as compared with the previous association is indicated by an increase in the role of *Larix sibirica* and xero-mesophytes.

Adenophoro lamarcki-Laricetum sibiricae ligularietosum glaucae Ermakov subass. nova hoc loco
(Table III: *12, 13*)

Nom. type is relevé nr. 8, Table XIII.
Diagnostic species: *Aulacospermum anomalum, Ligularia glauca, Neottianthe cucullata, Polygonatum humile, Ranunculus polyanthemos, Rosa majalis, Veratrum nigrum, Viola mirabilis.*

Temperate thermophytic forests of the lower part of the forest belt (400 - 800 m).

Variant *Filipendula stepposa* (Table III: *12*) includes more xeric variant of the subassociation with participation of meso-xerophytes: *Achnatherum sibiricum, Filipendula stepposa, Galatella biflora.*

Adenophoro lamarcki-Laricetum sibiricae anemonastretosum crinitae Ermakov subass. nova hoc loco
(Table III: *14*)

Nom. type is relevé nr. 9, Table XIII.
Diagnostic species: *Anemonastrum crinitum, Astragalus propinquus, Bistorta vivipara.*

These are birch-larch grass forests with participation of South-Siberian-Mongolian species. They occur in more cold and continental mesoclimate as compared with the previous subassociation, at altitudes of 700-1200 m.

Calamagrostio pavlovi-Laricetum sibiricae Ermakov ass. nova hoc loco (Table III: *15-19*)

Nom. type is relevé nr. 10, Table XIII.
Diagnostic species: *Calamagrostis pavlovii, Carex amgunensis, Orthilia secunda, Pedicularis resupinata, Picea obovata, Pinus sibirica, Pyrola incarnata, P. rotundifolia, Hylocomium splendens, Vaccinium vitis-idaea, Vicia cracca.*

Xero-mesophytic birch-larch mixed and larch forests of the temperate cold and continental climatic sector of the Central Sayani and North Tuva. The forests form the lower part of the forest belt and are the component of the forest-steppe at the edge of intermountain hollows. They occupy the north-western and north-eastern slopes with poorly-developed soils at altitudes of 900-1400 m. These forests are the most cryophytic-continental type of the *Brachypodio-Betuletea* and they possess some floristic features which are characteristic of the ultracontinental Mongolian larch forests of the *Rhytidio-Laricetea*. This is a decrease in the amount of thermophilous mesophytes and an increase of role of xero-mesophytes and boreal moderate cryophytes.

Variant *Spiraea media* (Table III: *16*) includes community with the predominance of shrub *Spiraea media* which occurs on steep slopes with weakly developed soils.

Variant *Bergenia crassifolia* (Table III: *17*) includes petrophytic community with high role of obligate petrophyte *Bergenia crassifolia* which occurs in the rocky sites.

Variant *Dracocephalum ruyschiana* (Table III: 18) includes more xeric community of the association with participation of meso-xerophytes: *Carex caryophyllea, C. obtusata, Dracocephalum ruyschiana, Elymus gmelinii, Veratrum nigrum.*

Variant *Allium microdictyon* (Table III: *19*) includes community occurring in the cold mesic sites of narrow mountain river valleys.

Vicio unijugae-Pinenion sylvestris Korolyuk in Ermakov *et al.* 1991
(Table IV: *1-9*)

Nomenclatural type is the association *Astragalo glycyphylli-Pinetum sylvestris.*

Hemiboreal forests of drained plains of the south-western part of West Siberia. They occupy flat sites and undulations with grey forest soils in watersheds of the southern part of the forest zone. In the forest-steppe zone, the forests occur on moderately dry slopes of ravines, small hills and higher terraces of river valleys at altitudes of 140-250 m.

Diagnostic species are moderately thermophilous European-Siberian meso-xerophytes, which have the eastern boundaries of their ranges at the south-eastern limit of the West Siberian Plain (*Adenophora liliifolia, Filipendula vulgaris, Geranium bifolium, Origanum vulgare, Polygonatum humile, Poa angustifolia, Ranunculus polyanthemos, Rosa majalis, Seseli libanotis, Vicia tenuifolia, Viola hirta*). Some analogous communities are reported by KRYLOV (1961), LAPSHINA (1985) from the southern part of the West Siberian Plain.

Artemisio latifoliae-Betuletum pendulae Ermakov, Makunina et Maltseva ex hoc loco
(Table IV: *1-3*)

Nom. type is relevé nr. 12, Table XIII.
Diagnostic species: *Artemisia latifolia, Artemisia macrantha, Galium verum, Peucedanum morisonii, Veratrum nigrum, Primula cortusoides.*

These are primary pine-birch and secondary birch xero-mesophilous grass forests widespread in the forest-steppe zone of well-drained elevated plains of West Siberia. They occupy moderately dry sites on watersheds with zonal grey soils.

Artemisio latifoliae-Betuletum pendulae typicum Ermakov, Makunina et Maltseva ex hoc loco
(Table IV: *3*)

Nom. type is relevé nr. 12, Table XIII.
Diagnostic species are those of the association.

Birch forests of the low depressions in the central part of the Kuznetskaya pedimental hollow.

Artemisio latifoliae-Betuletum pendulae ligularietosum glauci Ermakov, Makunina et Maltseva ex hoc loco
(Table IV: *1*)

Nom. type is relevé nr. 11, Table XIII.
Diagnostic species: *Artemisia vulgaris, Festuca rubra, Galatella biflora, Ligularia glauca, Pimpinella saxifraga, Poa urssulensis, Trisetum sibiricum.*

Birch forests of the upper slopes of deep depressions in the eastern part of the Ob river basin.

Artemisio latifoliae-Betuletum pendulae pinetosum prov.
(Table IV: *2*)

Five relevés of these pine grass forests (nr. 8, 3, 24, 6, 9 of Table 4 in ERMAKOV *et al.*, 1991) described in the foot-hills of the Salair Mts were formally included in the association *Artemisio macranthae-Pinetum sylvestris* Lashchinsky in Ermakov *et al.* 1991. In the present study, they are preliminary included in the separate subassociation.

Calamagrostio arundinaceae-Betuletum pendulae Dymina ex hoc loco
(Table IV: *4, 5*)

Nom. type is relevé nr. 13, Table XIII. Diagnostic species of the association are those of the suballiance.

Primary birch-pine and secondary birch forests of the well-drained sites of the forest-steppe and subtaiga zones of the eastern part of the Ob river basin and foot-hills of the Salair mountains. They occur on northern slopes of ravines and hills, on the mesic rich loamy soils.

Calamagrostio arundinaceae-Betuletum pendulae typicum subass. nova hoc loco
(syn. *C.a.-B.p. polygonetosum humilis* Ermakov 1994 nom.nud.)
(Table IV: *4*)

Nom. type is relevé nr. 13, Table XIII. Diagnostic species: *Crepis sibirica, Euphorbia pilosa, Padus avium.*

Secondary birch forests of the lower parts of gentle north-facing slopes of deep ravines and small hills with moist rich soils.

Calamagrostio arundinaceae-Betuletum pendulae fragarietosum viridis Ermakov, Makunina et Maltseva ex hoc loco
(Table IV: *5*)

Nom. type is relevé nr. 14, Table XIII. Diagnostic species: *Achillea millefolium, Campanula altaica, Fragaria viridis.*

Secondary birch forests of the higher parts of gentle north-facing slopes and flat watersheds with mesic rich soils.

Roso spinosissimae-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table IV: *6*)

Nom. type is relevé nr. 15, Table XIII.

Diagnostic species: *Aconogonon alpinum, Adonis sibirica, Artemisia sericea, Aulacospermum anomalum, Cirsium serratuloides, Clematis integrifolia, Daphne altaica, Dictamnus albus, Galatella angustissima, Hieracium virosum, Lonicera tatarica, Moehringia lateriflora, Potentilla chrysantha, Rosa pimpinellifolia, Veronica spuria.*

This association was described from the foot-hills of the South-Western Altai (North-Eastern Kazakhstan). These rare pine forests occur on the discrete granite mountain massifs in the steppe zone. They occupy the lower parts of gentle northern slopes with the mesic gravel soils on granite bedrock at altitudes of 650-900 m.

Astragalo glycyphylli-Pinetum sylvestris Korolyuk in Ermakov *et al.* 1991
(Table IV: *7*)

Diagnostic species, mesophilous and thermophilous plants, occur only in the warm wide river valleys of the southern part of West Siberia: *Aegopodium podagraria, Agrostis gigantea, Astragalus glycyphyllos, Carex pallescens, Lysimachia vulgaris, Melilotoides platycarpos.*

Pine-birch forests of the old higher terraces of the Ob river. They occupy flat mesic sites of the terraces with mesotrophic sandy-loamy soils.

Cnidio dubii-Pinetum sylvestris Lashchinsky 1991 (ib.)
(Table IV: *8*)

Diagnostic species are oligotrophic mesophytes: *Dactylorhiza hebridens, Kadenia dubia, Maianthemum bifolium, Platanthera bifolia, Vaccinium myrtillus.*

Pine grass forests of foot-hills of the eastern part of the lower Salair Mts. They occur in the middle and upper parts of gentle slopes with weak-developed grey soils on the chloride slates at elevations of 300-400 m.

Achyrophoro-Pinenion sylvestris Ermakov et Lashchinsky 1991 (ib.)
(Table IV: *9-17*)

Nomenclatural type is the association *Thesio repentis-Pinetum sylvestris.*

Diagnostic species: *Anemonastrum crinitum, Antennaria dioica, Dendranthema zawadskii, Cypripedium guttatum, Festuca ovina, Pyrola incarnata, Pulsatilla patens, Thesium repens, Trommsdorfia maculata, Vaccinium vitis-idaea.*

Hemiboreal forests of the eastern part of the *Brachypodio-Betuletea* class range. They are formed in the moderately cold continental climate of the Middle Siberian Plateau and southern part of Transbaikal Mts. There, the forests occupy moist, relatively warm sites - southern, western and eastern slopes of hills and lower mountains at altitudes of 200-600 m. Communities of the suballiance are everywhere in contact with boreal forests of the *Vaccinio-Piceetea* occurring in colder and moister sites. In the forest-steppe intermountain hollows, they are in contact with steppes of the class *Festuco-Brometea*. The regional moderately cold, continental climate is unfavourable for growth of the majority of thermophilous European-Siberian species. Simultaneously, these environments determine the presence of species of contrasting ecology in the suballiance forests: boreal mesophytes and meadow-steppe meso-xerophytes. Analogous forest types were characterized by VASILYEV (1931), POPOV (1961), BUTORINA (1963), KAMENETSKAYA *et al.* (1963), PESHKOVA (1964), POBEDINSKY (1965), LASHCHINSKY (1981).

Festuco ovinae-Pinetum sylvestris Ermakov 1991 (ib.)
(Table IV: *9-11*)

Diagnostic species are dominantly boreal plants: *Ledum palustre, Linnaea borealis, Vaccinium uliginosum, Trientalis europaea, Duschekia fruticosa, Anemonoides reflexa, Tephroseris integrifolia, Luzula pilosa, Polytrichum strictum.*

Temperate cryophilous grass pine forests of the northern part of subtaiga subzone. Small areas of these forests occupy northern gentle slopes of hills and lower mountains with moist rich loamy grey soils at altitudes of 450-700 m, where they are in contact with widespread communities of the class *Vaccinio-Piceetea.*

Festuco ovinae-Pinetum sylvestris rhododendretosum davuricae Ermakov subass. nova hoc loco
(Table IV: *9*)

Nom. type is relevé nr. 16, Table XIII.

These are pine forests with *Rhododendron dauricum* forming a well-developed shrub layer. This subassociation represents typical hemiboreal forests of the eastern part of the Middle Siberian Plateau.

Festuco ovinae-Pinetum sylvestris vaccinietosum myrtilli Ermakov subass. nova hoc loco
(Table IV: *10*)

Nom. type is relevé nr. 17, Table XIII.
Diagnostic species: *Pyrola rotundifolia, Solidago dahurica, Viola arenaria, Vaccinium myrtillus, Vicia multicaulis, Gymnocarpium dryopteris, Polygala comosa.*

These grass pine forests with participation of boreal species occupy small and low depressions on northern slopes with the moist, moderately cold soils.

Festuco ovinae-Pinetum sylvestris typicum Ermakov subass. nov. hoc loco
(Table IV: *11*)

Nom. type is relevé nr. 69, Table 3 in ERMAKOV *et al.*, 1991.
Diagnostic species: *Picea obovata, Polytrichum commune, Ranunculus propinquus, Vicia venosa, V. baicalensis.*

Mesophytic pine grass forests with participation of East Asian species of the eastern part of the Middle Siberian Plateau.

Crepido praemorsae-Pinetum sylvestris Ermakov in Ermakov *et al.* 1991
(Table IV: *12-14*)

Diagnostic species are xero-mesophytes: *Aconitum barbatum, Adenophora lamarckii, Allium strictum, Artemisia tanacetifolia, Astragalus propinquus, Crepis praemorsa, Galium verum, Phlomoides tuberosa, Polygonatum odoratum, Scorzonera radiata, Silene nutans.*

Xero-mesophilous pine and birch-pine mixed forests widespread in the southern part of the Middle Siberian Plateau. They are a component of forest-steppe zone of the large inter-mountain hollows with temperate dry, continental climate. The forests occur on sunny slopes of small hills with the dark-grey loamy soils at altitudes of 350-500 m.

Crepido praemorsae-Pinetum sylvestris typicum Ermakov subass. nova hoc loco
(Table IV: *12*)

Nom. type is relevé nr. 14, Table 2 in ERMAKOV *et al.*, 1991.
Diagnostic species of the subassociation are those of the association.

The typical community of the association.

Variant *Hemerocallis minor* (Table IV: *13*) includes the geographical type of the subassociation which occur in the forest-steppe zone of the western part of the Middle Siberia.

Crepido praemorsae-Pinetum sylvestris asteretosum tatarici Ermakov subass. nova hoc loco
(Table IV: *14*)

Nom. type is relevé nr. 20, Table XIII.
Diagnostic species: *Aster tataricus, Carex amgunensis, Elymus ircutensis, Gentiana macrophylla, Heteropappus biennis, Potentilla fragarioides, Vicia amoena, Zigadenus sibiricus.*

Xero-mesophilous pine grass forests with some Eastern-Asian species. They are widespread in the forest-steppe zone of the eastern part of the Middle Siberia.

Thesio repentis-Pinetum sylvestris Ermakov in Ermakov *et al.* 1991
(Table IV: *15*)

Nom. type is relevé nr. 21, Table XIII (relevé 25, Table 1 in ERMAKOV *et al.*, 1991).
Diagnostic species are mostly thermophilous mesophilous European-Siberian plants: *Dactylorhiza maculata, Geranium sylvaticum, Lathyrus gmelinii, L. vernus, Parnassia palustris, Pedicularis resupinata, Vicia sylvatica.*

Mesophytic temperate thermophilous birch-pine forests of the temperate-continental western sector of the Middle-Siberian Plateau. They represent the predominant zonal forest type and occupy different slopes of hills and lower mountains with the rich grey loamy soils at altitudes of 350-700 m.

In the original publication (ERMAKOV *et al.*, 1991), this association was represented by two subassociations *Thesio repentis-Pinetum sylvestris typicum* and *Thesio repentis-Pinetum sylvestris vaccinietosum myrtilli.* More comprehensive data involved have revealed an absence of distinct phytosociological and ecological distinctions between these two former subassociations. In the present study, the association *Thesio repentis - Pinetum sylvestris* is not subdivided into smaller units.

Geranio vlassowiani-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table IV: *16, 17*)

Nom. type is relevé nr. 23, Table XIII.

The easternmost community of the class *Brachypodio-Betuletea.* These birch-pine mixed forests occur in the lower stripe of the forest belt in the southern part of Baikal region (the Khamar-Daban ridge). They occupy northern slopes with rich mesic soils at altitudes of 600-1200 m.

Diagnostic species of the association, thermophilous mesophilous Manchurian-Daurian, are: *Betula platyphylla, Geranium vlassowianum, Lilium pensylvanicum, Ranunculus japonicus, Rhododendron dauricum, Vicia baicalensis, V. venosa.* They indicate some plant-geographical features transitional to the Eastern-Asian hemiboreal forests of the class *Querco mongolicae-Betuletea davuricae.*

Geranio vlassowiani-Pinetum sylvestris geranietosum eriostemonis Ermakov subass. nova hoc loco
(Table IV: *16*)

Nom. type is relevé nr. 23, Table XIII.
Diagnostic species: *Allium splendens, Carex amgunensis, Equisetum hyemale, Geranium eriostemon, Hieracium ganeschinii, Malaxis monophyllos, Moehringia lateriflora, Iris uniflora, Larix gmelinii, Potentilla fragarioides, Scorzonera radiata, Vicia amoena, Viola sacchalinensis.*

Xero-mesophilous birch-pine mixed forests of the eastern part of the Khamar-Daban ridge (southern part of Baikal).

Geranio vlassowiani-Pinetum sylvestris polemonietosum chinensis Ermakov subass. nova hoc loco
(Table IV: *17*)

Nom. type is relevé nr. 24, Table XIII.
Diagnostic species: *Calamagrostis korotkyi, Carex pediformis Fragaria orientalis, Poa sibirica, Polemonium chinense, Tragopogon orientalis.*

Mesophilous birch-pine forests of the north-eastern foot-hills of the Khentei mountain system.

Lathyro gmelinii-Pinion sylvestris Ermakov in Ermakov *et al.* 1991
(Table V)

Nomenclatural type is the association *Dentario sibiricae-Pinetum sylvestris* Ermakov 1991 (ib.).
Diagnostic species: *Populus tremula, Aconitum septentrionale, Athyrium filix-femina, Lathyrus gmelinii, Milium effusum, Paris quadrifolia, Stellaria bungeana, Calamagrostis obtusata, Cirsium heterophyllum, Veratrum lobelianum.*

Hemiboreal pine-birch and birch-

aspen mixed forests of strongly-flushed habitats with mainly fertile soils. In addition, the sites have deep snow cover in the winter period, which protects the soils from frost. These conditions are favourable for growth of tall-forb hygro-mesophilous subalpine-forest species (*Aconitum septentrionale, Cirsium heterophyllum, Lathyrus gmelinii, Veratrum lobelianum*), and some themophilous subnemoral and mesophilous south-boreal plants (*Athyrium filix-femina, Calamagrostis obtusata, Paris quadrifolia, Populus tremula, Stellaria bungeana*). The tall-forb species determine the main phytosociological peculiarity of the communities included here - well-developed herb layer, with a cover of 80-100%, about 1.5 m in height and subdivided into several sublayers.

The alliance includes three regional suballiances, which geographically correspond to suballiances of the alliance *Vicio unijugae-Pinion* and they are spread in the main orographic regions of South Siberia: elevated drained plains of West Siberia, the Middle Siberian Plateau and the Altai-Sayani mountain system.

Geranio albiflori-Pinenion sylvestris Ermakov in Ermakov *et al.* 1991
(Table V: *1-11*)

Nomenclatural type is the association *Dentario sibiricae-Pinetum sylvestris* Ermakov 1991 (ib.).

Grass forests of the Altai and Sayani. They are widespread in the humid and ultrahumid cyclonic climatic sectors. These forests occur on gentle northern slopes in the lower strip of the forest belt at altitudes of 350-1400 m. One of the main their peculiarities is the presence of spring geophytes forming a temporary sublayer with a cover of 40-90%. In the more continental climate, the communities belonging to this suballiance occupy moist deep depressions on northern slopes and at the bottoms of ravines.

The group of diagnostic species includes Altaian-Sayanian endemics (*Aconitum krylovii, Cruciata krylovii, Erythronium sibiricum, Euphorbia pilosa, Geranium albiflorum, Lathyrus frolovii*) and species with the European-Siberian disjunctive ranges (*Cerastium pauciflorum, Primula macrocalyx, Spiraea chamaedryfolia*).

Analogous forest types were characterized by KUMINOVA (1960); RECHAN and KRYLOV (1963); KRYLOV and RECHAN (1967); BUDNIKOVA (1973); MASKAYEV (1985); ERMAKOV (1987).

Geranio albiflori-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table V: *1*)

Nom. type is relevé nr. 25, Table XIII. Diagnostic species of the association are those of the suballiance.

This association was described from the humid cyclonic sector of the North Altai. The forests occupy northern slopes with weakly developed acid soils on the granite bedrock. These ecological conditions cause some impoverishment of the floristic composition of the herb layer.

Atrageno sibiricae-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table V: *2*)

Nom. type is relevé nr. 26, Table XIII. Diagnostic species are moderate xero-mesophytes and facultative petrophytes: *Polygonatum odoratum, Cirsium serratuloides, Caragana arborescens.*

Pine-birch grass forests of the driest sites in the ultrahumid cyclonic sector of the North Altai. They occur on steep southern slopes with stony soils at altitudes of 400-600 m.

Dryopterido expansae-Pinetum sylvestris Ermakov nom. novum
(Table V: *3*)
(syn. *Caragano fruticis-Pinetum sylvestris* Ermakov in Ermakov *et al.* 1991).

Nom. type is relevé nr. 27, Table 11 in ERMAKOV *et al.*, 1991.
Diagnostic species: *Caragana frutex, Dryopteris expansa, Dianthus superbus, Lycopodium annotinum.*

These azonal birch-pine forests occur in the higher terraces of the Biya river valley, in ultrahumid climatic sector of the Altai. They occupy the flat parts and shallow depressions with humid carbonate soils on the hillwash covering the glaciofluvial sandy-gravel terraces. The role of tall-forbs decreases in the forests and that of the xero-mesophytes and moderate cryophytes (*Adonis sibirica, Caragana frutex, Dryopteris expansa, Dianthus superbus, Lycopodium annotinum*) becomes more important.

Dentario sibiricae-Pinetum sylvestris Ermakov in Ermakov *et al.* 1991
(Table V: *4-6*)

Diagnostic species: *Aegopodium podagraria, Circaea alpina, Corydalis bracteata, Dryopteris filix-mas, Elymus caninus, Festuca gigantea, Sanicula giraldii, Stachys sylvatica, Urtica dioica.*

Thermophilous hygro-mesophilous pine-birch-aspen grass forests of the humid and ultrahumid cyclonic climatic sectors of the North Altai. They occupy the lower parts of gentle slopes of various aspects with rich wet soils at altitudes of 300-600 m. The main peculiarity of the forests is the important role of thermophilous nemoral grasses which are relict plants in Siberia (*Adoxa moschatellina, Aegopodium podagraria, Dryopteris filix-mas, Elymus caninus, Festuca gigantea*). They indicate the features of the association transitional to relict Siberian *Fagetalia sylvaticae* (*Abietenalia sibiricae*) forests occurring on more humid mountain slopes.

Dentario sibiricae-Pinetum sylvestris typicum Ermakov subass. nova hoc loco
(Table V: *4*)

Nom. type is relevé nr. 55, Table 10 in ERMAKOV *et al.*, 1991.

Typical vegetation of the association.

Dentario sibiricae-Pinetum sylvestris abietetosum sibiricae Ermakov subass. nov. hoc loco
(Table V: *5*)

Nom. type is relevé nr. 28, Table XIII. Diagnostic species: *Abies sibirica, Brunnera sibirica, Daphne mezereum, Oxalis acetosella, Pinus sibirica.*

Transitional vegetation to the dark-coniferous subnemoral forests.

Dentario sibiricae-Pinetum sylvestris matteuccietosum Ermakov subass. nova hoc loco
(Table V: *6*)

Nom. type is relevé nr. 29, Table XIII.
Diagnostic species: *Matteuccia struthiopteris, Geum aleppicum, Dentaria sibirica, Carex arnellii, Humulus lupulus, Elymus sibiricus, Cerastium davuricum.*

Vegetation of sites with excessive moisture as in shallow gulches and lower stream terraces.

Saussureo parviflorae-Laricetum sibiricae Ermakov ass. nova hoc loco
(Table V: *7*)

Nom. type is relevé nr. 30, Table XIII. Diagnostic species: *Saussurea parviflora, Vicia megalotropis, Impatiens noli-tangere, Hylocomium splendens, Calamagrostis langsdorffii.*

Mixed hygro-mesophilous larch-birch and secondary birch grass forests of the Central Altai. The communities replace thermophilous forests of the association *Dentario sibiricae-Pinetum sylvestris* as far as the climate continentality increases towards the interior part of the mountain system.

They occupy sunless slopes with moist rich soils at altitudes of 600-1200 m. The floristic composition of the forests is impoverished because these climatic conditions are unfavourable for growth of the thermophilous mesophytes.

Polygonato humilis-Betuletum pendulae Ermakov ass. nova hoc loco
(Table V: *8*)

Nom. type is relevé nr. 31, Table XIII.
Diagnostic species: *Adenophora lamarckii, Bromopsis pumpelliana, Campanula glomerata, Delphinium retropilosum, Phlomoides tuberosa, Polygonatum humile.*

Secondary birch forests (on the place of mixed larch-birch zonal forests) of the temperate continental climatic sector of the eastern macroslope of the Kuznetskiy Alatau ridge. They occupy the lower parts of northern slopes with rich soils at altitudes of 400-600 m. These habitats are characterised by a variable moisture regime during the growth period resulting in mixed combination of mesophilous and xero-mesophilous species.

Brunnero sibiricae-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table V: *9, 10*)

Nom. type is relevé nr. 33, Table XIII.
Diagnostic species: *Anemonoides reflexa, Bistorta major, Brunnera sibirica, Anemonoides jenisseens, Vicia lilacina, Allium microdictyon.*

Temperate thermophilous mixed pine-birch-aspen forests of the foot-hills of the West Sayani. They occur in the lower parts of northern, north-eastern and north-western gentle slopes with rich soils at altitudes of 350-600 m. Communities of the association and the Altaian *Dentario sibiricae-Pinetum* forests are geographic vicariants. The floristic composition of the *Brunnero-Pinetum* is characterised by a more impoverished group of thermophilous nemoral species and the presence of a regional group of Altai-Sayanian species: *Anemonoides jenisseensis, A. reflexa, Brunnera sibirica, Vicia lilacina.*

Brunnero sibiricae-Pinetum sylvestris typicum Ermakov subass. nova hoc loco
(Table V: *9*)

Nom. type is relevé nr. 33, Table XIII.

Typical community of the association which occurs in mesic sites.

Brunnero sibiricae-Pinetum sylvestris equisetosum sylvaticae Ermakov subass. nova hoc loco
(Table V: *10*)

Nom. type is relevé nr. 32, Table XIII.
Diagnostic species: *Equisetum sylvaticum, Melilotoides platycarpos, Deschampsia cespitosa, Lysimachia vulgaris, Moehringia lateriflora, Geum aleppicum.*

Community of the hygro-mesic sites.

Paeonio anomalae-Laricetum sibiricae Ermakov ass. nova hoc loco
(Table V: *11*)

Nom. type is relevé nr. 34, Table XIII.
Diagnostic species: *Calamagrostis pavlovii, Caragana arborescens, Pedicularis resupinata, Picea obovata, Pyrola rotundifolia, P. incarnata, Vicia cracca, Valeriana alternifolia.*

Hygro-mesophilous mixed larch-birch forests (sometimes with aspen) of the continental climatic sector of the Central Sayani. They occur in moderately cold wet depressions between slopes with excessive flushing and rich soils at altitudes of 900-1200 m. The role of the moderately cryophilous boreal species of the class *Vaccinio-Piceetea* (*Picea obovata, Pyrola rotundifolia, P. incarnata*) and some continental species (*Calamagrostis pavlovii, Pedicularis resupinata, Valeriana alternifolia*) increases in the association.

Euphorbio pilosae-Caraganetum arborescentis Lashchinsky et Revyakina 1992

The association including the tall shrub (*Caragana arborescens*) communities was described by LASHCHINSKY and REVJAKINA (1991) in the foot-hills of the lower Salair mountains.

Geranio sylvaticae-Pinenion sylvestris Ermakov suball. nova hoc loco
(Table V: *12, 13*)

Nomenclatural type is the association *Trollio asiaticae-Populetum tremulae.*
Diagnostic species: *Aegopodium podagraria, Carex pallescens, Geranium sylvaticum, Lathyrus vernus.*

Moderately thermophilous hygro-mesophilous pine-birch-aspen forests of the elevated south-eastern part of the West Siberian Plain.

These forests are formed in the temperate continental climate with mild winters and warm summers. During the winter a deep snow layer (up to 1 m) protects soils from frost. These conditions are favourable for the thermophilous European-Siberian and West-Siberian mesophytes (*Aegopodium podagraria, Carex pallescens, Geranium bifolium, G. sylvaticum*). These species occurring here at the eastern boundary of their ranges are important floristic geographical indicators. Besides, moderately cryophilous boreal species are absent in these forests (in contrast to what occurs in hemiboreal forests of the Middle Siberian Plateau).

Analogous forest types were characterized by KRYLOV, 1961; DYMINA, 1989.

Trollio asiaticae-Populetum tremulae Dymina ex hoc loco
(Table V: *12*)

Nom. type is relevé nr. 35, Table XIII.
Diagnostic species are those of the suballiance.

Small-leaved grass forests of the foot-hills of the Salair low mountain ridge and adjacent high watersheds of the West Siberian Plain. They occupy northern slopes of hills, depressions and ravines with wet rich soils.

Melilotoido platycarpi-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table V: *13*)

Nom. type is relevé nr. 36, Table XIII.
Diagnostic species: *Agrostis gigantea, Astragalus glycyphyllos, Inula salicina, Phleum pratense, Phragmites australis, Thalictrum simplex.*

These are meso-eutrophic pine-birch-aspen grass forests occurring on the higher ancient terraces of the Ob river valley and neighboring watersheds. They occupy the shallow depressions with wet soils formed on the sandy-loamy parent material. The combination of the meadow hygrophytes, mesophytes and xero-mesophytes is characteristic of these forests.

The birch forests belonging to this association were characterized by FALINSKI (1990, 1995a) from subzone of small-leaved forests in the West Siberian Plain.

Carici macrourae-Pinenion sylvestris Ermakov in Ermakov *et al.* 1991 (Table V: *14-16*)

Nomenclatural type is the association *Spiraeo salicifoliae-Pinetum sylvestris.*

Diagnostic species are moderately cryophilous boreal (taiga) and meadow plants: *Trientalis europaea, Gymnocarpium dryopteris, Vaccinium vitis-idaea, Vicia venosa, Vicia cracca.*

Hygro-mesophilous pine-birch forests of the Middle Siberian Plateau. They are formed in the temperate cold-continental climate of the subtaiga and southern part of taiga subzones. These forests occupy small depressions in the gentle slopes of hills and river valleys with wet and cold soils at altitudes of 200-600 m. Everywhere the forests indicate the ecological boundary between the *Brachypodio-Betuletea* and *Vaccinio-Piceetea*. Communities of the latter class occupy more cryophitic sites with seasonally frozen soils and sometimes with permafrost. In the drier slopes of hills the suballiance communities are replaced by xero-mesophilous hemiboreal forests of the suballiance *Achyrophoro-Pinenion*. Analogous forest types were characterized by POVARNITSYN (1931); POPOV (1961); KAMENETSKAYA *et al.* (1963); VODOPYANOVA (1964); POBEDINSKY (1965); TYULINA (1976).

Matteuccio-Pinetum sylvestris Ermakov ass. nova hoc loco (Table V: *14*)

Nom. type is relevé nr. 37, Table XIII. Diagnostic species of the association are those of the suballiance.

Typical communities of the suballiance widespread in the southern part of the Middle Siberian Plateau. They occur on gentle north-eastern and north-western slopes of hills with mesic drained soils and on the terraces of river valleys.

Spiraeo salicifoliae-Pinetum sylvestris Ermakov in Ermakov *et al.* 1991. (Table V: *15*)

Diagnostic species: *Allium microdictyon, Anemonoides altaica, Bistorta major, Cypripedium macranthon, Salix starkeana, Spiraea salicifolia, Vicia lilacina, Galium uliginosum, Pedicularis resupinata, Picea obovata, Pyrola media, Rubus arcticus.*

Mixed pine-birch forests occurring in the south taiga subzone. They occupy sites with over-saturated soil and with limited drainage.

Duschekio fruticosae-Pinetum sylvestris Ermakov ass. nova hoc loco (Table V: *16*)

Nom. type is relevé nr. 38, Table XIII. Diagnostic species are moderately cryophilous boreal mesophytes: *Anemonastrum crinitum, Duschekia fruticosa, Trisetum sibiricum, Vaccinium myrtillus.*

Mixed pine-aspen grass forests of the northern slopes of the Khamar-Daban ridge under the influence of Baikal Lake microclimate. The communities are the more continental climatic eastern analogues of the *Carici macrourae-Pinetum* forests. They occur in well-drained hygro-mesic sites in the western and eastern slopes at altitudes of 800-900 m.

CHAMAECYTISO RUTHENICI-PINETALIA SYLVESTRIS Solomeshch et Ermakov ord. nova hoc loco

Nomenclatural type is the alliance *Veronico teucrii-Pinion sylvestris.*

This order includes light coniferous and small-leaved-coniferous (*Betula pendula, Pinus sylvestris, Larix sibirica*) continental hemiboreal forests of the South Urals. They are widespread in the foot-hills of the eastern macroslope (Siberian part) of the Ural mountain system, in the temperate continental climate. There, the *Chamaecytiso-Pinetalia* forests are a component of the lower part of the forest and forest-steppe belts at altitudes of 400-700 m. On the western macroslope of the Urals (with the humid cyclonic climate), the communities are dominantly replaced by broad-leaved and broad-leaved-coniferous forests of the *Querco-Fagetea*. There, the *Camaecytiso-Pinetalia* communities occupy the xero-mesic sites (southern, south-western and south-eastern slopes) and they are everywhere in contact with the broad-leaved and mixed forests occurring in more mesic sites.

The intermediate geographical location of the hemiboreal forests of the Urals between European thermophilous broad-leaved forests and Siberian continental small-leaved coniferous ones results in some difficulties of determination of their syntaxonomical position. In the transitional habitats, there are communities combining features of both classes. The most reliable diagnostic criteria for identification of the *Chamaecytiso-Pinetalia* forests are (1) a weak participation or absence of the thermophilous *Querco-Fagetea* characteristic species of the European plant geographical group (especially broad-leaved trees and nemoral shrubs) and (2) an increased role of East-European-Siberian and Asian light-demanding diagnostic species of the class *Brachypodio-Betuletea* as well as that of (3) meadow mesophytes of the *Molinio-Arrhenatheretea, Mulgedio-Aconitetea* and (4) xero-mesophytes of the *Festuco-Brometea* and *Trifolio-Geranietea* classes. The combination of these contrasting ecological and phytosociological groups is an important peculiarity of the floristic composition of all Siberian hemiboreal forests which indicates the changeable regime of warmth and moisture during the growth period.

The Urals *Chamaecytiso-Pinetalia* communities could not be included in the South-Siberian order *Carici macrourae-Pinetalia* because they are characterised by the absence of a large group of North Asian plants which are diagnostic species of the latter order and play leading role there.

The order *Chamaecytiso-Pinetalia* contains two alliances representing two large ecological and phytosociological types of hemiboreal forests occurring in meso-xeric and mesic habitats. Simultaneously, the distribution of these two alliances dominantly corresponds to main climatic and plant geographical sectors of the South Urals: western (humid, East European) and eastern (continental, West Siberian). It is also related with the differences between European and Siberian floristic provinces and with the role of the South Urals as a large plant geographical boundary in the interior part of Eurasia.

Diagnostic species of the order *Chamaecytiso-Pinetalia* are dominantly light-demanding European species spreading in the south-western part of the West Sibera as well as some East-European-West-Siberian and South-Siberian plants: *Adenophora liliifolia, Carex digitata, C. rhizina, Chamaecytisus ruthenicus, Digitalis grandiflora, Galium tinctorium, Geranium pseudosibiricum, Inula hirta, Primula macrocalyx, Silene nutans, Stachys officinalis, Trifolium medium, Trollius europaeus, Veronica chamaedrys, V. spuria, Viola canina, V. collina.*

Veronico teucrii-Pinion sylvestris Ermakov et Solomeshch all. nova hoc loco (Table VI: *1- 7*)

Nomenclatural type is the association *Genisto tinctoriae-Betuletum pendulae.*

Diagnostic species: *Artemisia armeniaca, A. sericea Carex caryophyllea, Cotoneaster melanocarpus, Dracocephalum ruyschiana, Elytrigia repens, Filipendula vulgaris, Fragaria viridis, Galium verum, Linaria vulgaris, Origanum vulgare, Phleum phleoides, Phlomoides tuberosa, Poa angustifolia, Pulsatilla patens, Ranunculus polyanthemos, Seseli libanotis, Veronica spicata, V. teucrium.*

These are meso-xerophilous and xero-mesophilus birch-pine and birch grass forests. They are widespread in the forest-steppe belt and lower part of the forest belt of the South Urals. The communities belonging to this alliance predominate in the eastern foothills of the mountain system. There, they occur on gentle slopes of various aspects of low mountains at altitudes of 400-700 m. These sites are characterized by well-developed mesic and xero-mesic grey solis. An increase of the climate continentality on eastern macro-slope of the South Urals (the Siberian part) results in a decrease of the role of thermophilous nemoral species of the *Querco-Fagetea* in the hemiboreal forests and in higher role of the xero-mesophytes which predominate in the grope of diagnostic species of the alliance.

Saussurëo controversae-Betuletum pendulae Ermakov ass. nova hoc loco
(Table VI: *1*)

Nom. type is relevé nr. 61, Table XIII.
Diagnostic species: *Crepis praemorsa, Inula salicina, Orthilia secunda, Pteridium aquilinum, Saussurea controversa, Viola montana.*

These are mesic secondary birch forests forming in the places of destroyed primary birch-pine-larch grass forests. They are widespread on the shaded gentle slopes and low depressions with well-developed grey soils.

Genisto tinctoriae-Betuletum pendulae Ermakov ass. nova hoc loco
(Table VI: *2*)

Nom. type is relevé nr. 85, Table XIII.
Diagnostic species: *Artemisia latifolia, A. macrantha, Carex praecox, C. obtusata C. tomentosa, Cerasus fruticosa, Euphorbia virgata, Festuca pseudovina, Genista tinctoria, Pimpinella saxifraga, Stellaria graminea, Tanacetum vulgare, Tephroseris integrifolia, Valeriana wolgensis.*

These are xero-mesophilous secondary birch grass forests occurring on dry steep and gentle southern, eastern and western slopes with poorly developed grey soils. The light demanding xero-mesophytes play the important role and predominate in the diagnostic group of the association.

Pyrethro corymbosi-Pinetum sylvestris Solomeshch ass. nova hoc loco
(Table VI: *3*, *4*)

Nom. type is relevé nr. 90, Table XIII.
Diagnostic species: *Agrostis gigantea, Bupleurum aureum, Campanula persicifolia, Dactylis glomerata, Galeopsis bifida, Hylotelephium caucasicum, Poa nemoralis, Pyrethrum corymbosum, Rhytidiadelphus triquetrus, Quercus robur, Stellaria holostea.*

This association includes pine, larch and birch grass forests occurring in moderately mesic sites with grey soils, on gentle slopes of various aspects as well as on flat summits of mountain ranges. They were described in the Zilairsky Plateau of the South Urals (Bashkortostan Republic). The communities belonging to the *Pyrethro-Pinetum* differ from those of the *Calamagrostio-Laricetum* in the high role of *Pyrethrum corymbosum*, *Poa nemoralis*, *Campanula persicifolia*, *Quercus robur* which are typical of xero-mesophilous broad-leaved forests of the alliance *Lathyro-Quercion* Solomeshch *et al.* 1983 (*Querco-Fagetea*, *Quercetalia pubescentis*). They are also characterized by absence or low constancy of some boreal and south-boreal mesophytes: *Maianthemum bifolium*, *Aconitum septentrionale*, *Bistorta major*, *Luzula pilosa.*

Variant *Larix sibirica* (Table VI: *3*) includes forests with predominance of larch in tree layer.

Variant *Pinus sylvestris* (Table VI: *4*) includes forests with the predominance of pine in tree layer.

Calamagrostio arundinaceae-Laricetum sibiricae Schubert, Jäger et Mahn ex Solomeshch ass. nova hoc loco
(Table VI: *6*)

Nom. type is relevé nr. 43, Table 5 in SCHUBERT *et al.* 1979 (p.p.256-259).
Diagnostic species: *Agrimonia eupatoria, Carex pediformis, Campanula bononiensis, Crataegus sanguinea, Elymus caninus, Euphorbia esula, Festuca rubra, Lathyrus tuberosus, Vaccinium vitis-idaea.*

This association was described in Uchalinsky administrative district of Bashkortostan Republic by SCHUBERT *et al.* (1979) without indication of the nomenclatural type. These are mesophilous larch and pine forests occurring on gentle slopes of various aspects and in flat sites of the eastern foothills of the South Ural. They are characterized by the poorest indexes of species richness in comparison with communities of other associations of the alliance.

Carici caryophylleae-Pinetum sylvestris Martynenko ass. nova hoc loco
(Table VI: *5*)

Nom. type is relevé nr. 89, Table XIII.
Diagnostic species: *Aconopogon alpinum, Antennaria dioica, Aster alpinus, Aulacospermum multifidum, Caragana frutex, Centaurea ruthenica, Centaurea sibirica, Dianthus versicolor, Festuca rupicola, Galium ruthenicum, Poa transbaicalica, Ptilium crista-castrensis, Seseli krylovii, Silene repens, Steris viscaria, Tragopogon orientalis, Turritis glabra, Viola rupestris.*

These are open pine-larch meso-xerophilous grass forests occurring on dry southern, south-western and south-eastern slopes of the upper parts of mountain ridges. They were described in the South Kraka Mts of the South Urals.

Serratulo gmelinii-Betuletum pendulae Solomeshch ass. nova hoc loco
(Table VI: *7*)

Nom. type is relevé nr. 91, Table XIII.
Diagnostic species: *Bromopsis inermis, Erysimum hieracifolium, Filipendula ulmaria, Galatella biflora, Plantago urvillei, Serratula gmelinii.*

The association comprises secondary mesophilous birch grass forests of the eastern foothills of the South Ural. They occur on gentle slopes, flat places and in the low depressions with grey soils. The communities of this association replace primary larch and pine grass forests because of clearings. The higher role of typical meadow mesophytes (*Bromopsis inermis, Carex praecox, Filipendula ulmaria*) is seen there due to the usage of these forests for haying and as a pastures.

Trollio europaei-Pinion sylvestris Fedorov ex hoc loco
(Table VI: *8-10*)

Diagnostic species: *Aconitum septentrionale, Aegopodium podagraria, Bistorta major, Cerastium pauciflorum, Cirsium heterophyllum, Dactylis glomerata, Lathyrus gmelinii, Luzula pilosa, Maianthemum bifolium, Milium*

effusum, Ranunculus acris, R. auricomus, Stellaria holostea, Succisa pratensis, Trientalis europaea.

These mixed mesophytic pine-birch (sometimes with *Larix sibirica*) grass forests are widespread in the western and central parts South Urals. They were described by FEDOROV (1991) and were placed in the order *Quercetalia pubescentis* Klika 1933 of the class *Querco-Fagetea*. Later, one association of the alliance was included in the class *Brachypodio-Betuletea* (ERMAKOV,1994).

The *Trollio europaei-Pinion sylvestris* differs from the previous alliance by the higher role of some European thermophilous nemoral herbs occurring at the eastern limits of their ranges here and by the predominance of mesophytes over species of other ecological groups (xero-mesophytes, xerophytes). The species of the class *Querco-Fagetea* do not play a leading role in the *Trollio europaei-Pinion sylvestris* but they are important indicators of the ecological peculiarities of the alliance.

Bupleuro longifoliae-Pinetum sylvestris Fedorov ex hoc loco
(Table VI: *8, 9*)

Nom. type is relevé nr. 86, Table XIII. Diagnostic species: *Bupleurum aureum, Potentilla erecta, Thalictrum flavum, Trommsdorfia maculata.*

These mesophilous pine (*Pinus sylvestris*) and secondary birch (*Betula pendula*) grass forests are widespread in the western and central part of the South Urals. They occupy gentle slopes of various aspects and shallow depressions with the mesic grey soils.

Bupleuro longifoliae-Pinetum sylvestris typicum Fedorov ex hoc loco
(Table VI: *8*)

Nom. type is relevé nr. 86, Table XIII.

These are pine and birch grass forests occurring in the middle and lower slopes of mountains.

Bupleuro longifoliae-Pinetum sylvestris seselietosum libanotis Fedorov ex hoc loco
(Table VI: *9*)

Nom. type is relevé nr. 87, Table XIII. Diagnostic species: *Euphorbia subcordata, Filipendula vulgaris, Origanum vulgare, Seseli libanotis.*

These pine and birch grass forests occur on more xeric sites in comparison with the previous subassociation. These are eastern, south-eastern, and south-western slopes and on the flat summits of the mountains with the poorly developed soils.

Myosotido sylvaticae-Pinetum sylvestris Fedorov ex hoc loco
(Table VI: *10*)

Nom. type is relevé nr. 88, Table XIII. Diagnostic species: *Abies sibirica, Carex pilosa, Filipendula ulmaria, Geum urbanum, Glechoma hederacea, Hypericum elegans, Myosotis sylvatica, Oxalis acetosella, Padus avium, Paris quadrifolia, Prunella vulgaris, Pyrola minor, Ranunculus propinquus, Rubus idaeus.*

These are pine grass forests occurring in mesic sites with the well-developed grey soils of the lower parts of gentle shaded slopes and in the river valleys. They are characterized by higher role of the European nemoral species indicating their transitional features to the *Fagetalia sylvaticae* forests.

CALAMAGROSTIO EPIGEI-BETULETALIA PENDULAE Korolyuk ex hoc loco
(Table VII)

Diagnostic species, mesophilous and xero-mesophilous plants tolerant of weak saline soil conditions are: *Artemisia macrantha, Calamagrostis epigeios, Galatella biflora, Geranium bifolium, Heracleum sibiricum, Kadenia dubia, Poa angustifolia* (incl. *Poa pratensis*).

Zonal birch (*Betula pendula, B. pubescens*) hemiboreal forests with participation of aspen (*Populus tremula*) and pine (*Pinus sylvestris*) of the West Siberian Lowland. This lowland, the largest in the world, has a very flat relief (altitudes of 100-150 m) causing poor drainage of the vast territory. As a result, the territory is saline and boggy. These two soil factors are of great importance for the genesis of the lowland flora and vegetation and surpass the influence of the sector climatic factors. That is why hemiboreal forests of the lowland and piedmont of West Siberia formed in the similar temperate continental climate are assigned to different orders.

In the southern part of the forest zone, the *Calamagrostio-Betuletalia* communities occupy small undulations with grey loamy solodic soils surrounded by wetlands with communities of the classes *Phragmiti-Magnocaricetea* Klika in Klika et Novak 1941, *Molinietalia* W. Koch 1926 and *Alnetea glutinosae* Br.-Bl. et Tx. ex. Westhoff *et al.* 1946. In the forest-steppe zone, the *Calamagrostio-Betuletalia* forests occupy shallow depressions with loamy dark grey solodic soils which are surrounded by zonal steppe communities of the *Festuco-Brometea* and halophytic *Asteretea tripolium* Westhoff et Beeftink 1962, *Festuco-Limonietea* Karpov et Mirkin 1985 and sometimes *Thero-Salicornietea* R. Tx. in R. Tx. et Oberd. 1958. Azonal pine forests of the order occupy ancient glacio-fluvial sandy sites with saline subsoil water.

Salinity of the soils is responsible for the poor floristic composition of the communities of the order and their simple phytocoenotic structure. The forests are characterised by an open, mono-oligodominant tree layer (cover of 40-60%) and by a poorly developed shrub layer. The herb layer has cover of 40-70% and there are 36-48 species per 200 m². A moss layer is not characteristic there. The order contains two alliances including forests formed in sites of different degrees of soil moisture.

Peucedano morisonii-Betulion pendulae Ermakov 1996
(Table VII: *1-10*)

Nomenclatural type is the association *Carici praecocis-Betuletum pendulae*-Diagnostic species are mainly East European-West Siberian xero-mesophytes and meso-xerophytes of the class *Festuco-Brometea*: *Filipendula vulgaris, F. stepposa, Peucedanum morisonii, Galium verum, Fragaria viridis, Seseli libanotis, Carex praecox, Origanum vulgare, Ranunculus polyanthemos, Artemisia latifolia, Phlomoides tuberosa, Polygonatum odoratum, Dracocephalum ruyschiana, Helictotrichon pubescens, Plantago urvillei, Anemone sylvestris.*

These are xero-mesophytic birch (*Betula pendula*) and azonal pine (*Pinus sylvestris*) grass forests of the forest-steppe and steppe zones. The habitats of the forests are characterized by weak salinity and a shortage of soil moisture.

Analogous forest types were characterized by GORODKOV (1915), LAVRENKO (1985), LAPSHINA (1985).

Peucedano morisonii-Betuletum pendulae Korolyuk ex hoc loco
(Table VII: *1, 2*)

Diagnostic species are those of the alliance.
Nom. type is relevé nr. 25 in KOROLYUK and KIPRIYANOVA, 1998 (p.79).

Xero-mesophytic birch grass for-

ests of the northern part of the forest-steppe zone. They occupy sites with deficient moisture supply indicated by a group of the alliance diagnostic species.

Peucedano morisonii-Betuletum pendulae typicum Ermakov subass. nova hoc loco
(Table VII: *1*)

Nom. type of the subassociation is that of the association.
Diagnostic species are those of the association.

These are the hemiboreal birch forests of the Baraba Lowland (the central part of the West Siberian Lowland).

Peucedano morisonii-Betuletum pendulae geranietosum pratensis Ermakov subass. nova hoc loco
(Table VII: *2*)

Nom. type is relevé nr. 39, Table XIII.
Diagnostic species: *Geranium pratense, Potentilla chrysantha, Delphinium retropilosum, Eryngium planum.*

The subassociation represts a geographical type of the association in the south-eastern edge of the West Siberian Lowland (Priobskoye Plateau).

Carici praecocis-Betuletum pendulae Ermakov 1996
(Table VII: *3-5*)

Diagnostic species: *Artemisia sericea, Carex caryophillea, Festuca pseudovina, Medicago falcata, Silene nutans.*

Xero-mesophytic birch grass forests of the middle and southern parts of the forest-steppe (sometimes steppe) zone. They are the most xeric birch forests of the West Siberian Lowland. Zonal soil moisture shortage is indicated by a group of diagnostic meso-xerophilous species of the association.

Carici praecocis-Betuletum pendulae typicum Ermakov subass. nova hoc loco
(Table VII: *3*)
Nom. type of the subassociation is that of association (in ERMAKOV 1996a).
Diagnostic species are those of the association.

Typical community occurring in the eastern part of the West Siberian Lowland.

Carici praecocis-Betuletum pendulae vicietosum unijugae Ermakov subass. nova hoc loco
(Table VII: *4*)

Nom. type is relevé nr. 40, Table XIII.
Diagnostic species: *Astragalus danicus, Viola persicifolia, Vicia unijuga, Adenophora liliifolia.*

A more mesophytic variant occurring in the eastern part of the West Siberian Lowland.

Carici praecocis-Betuletum pendulae cerasetosum fruticosae Ermakov subass. nova hoc loco
(Table VII: *5*)

Nom. type is relevé nr. 41, Table XIII.
Diagnostic species: *Cerasus fruticosa, Adonis vernalis, Artemisia armeniaca, Centaurea scabiosa, Euphorbia virgata, Galium tinctorium, Trifolium medium.*

The geographical association type widespread in the south-western edge of the West Siberian Lowland.

Caragano arborescentis-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table VII: *6*)

Nom. type is relevé nr. 42, Table XIII.
Diagnostic species: *Caragana arborescens* (dom.), *Neottianthe cucullata, Poa nemoralis.*

These are azonal xero-mesophilous psammophilous pine grass forests occurring in the southern part of the forest-steppe zone. They occupy the moderately mesic oligotrophic depressions of the ancient glaciofluvial sandy deposits. The floristic composition of the association is characterised by considerable impoverishment because of disappearance of mesophytes, playing an important phytocoenotic role in the communities of the previous association. This impoverishment is connected with southern zonal location of the forests in the more arid climate). The oligotrophic soils of the habitats are indicated by facultative psammophytes *Caragana arborescens* and *Neottianthe cucullata.*

Equiseto hyemalis-Pinetum sylvestris Ermakov, Makunina et Maltseva ex hoc loco
(Table VII: *6*)

Nom. type is relevé nr. 45, Table XIII.
Diagnostic species: *Crepis praemorsa, Equisetum hyemale Fragaria vesca, Geranium sylvaticum, Lathyrus vernus, Maianthemum bifolium, Orthilia secunda, Pteridium aquilinum, Vaccinium vitis-idaea.*

These are mesophilous psammophilous pine grass forests of the northern part of the forest-steppe zone of the West Siberian Plain. They occur in oligotrophic and oligo-mesotrophic mesic sites on the ancient glaciofluvial sandy strips and higher terraces of river valleys. These local azonal habitats are favourable for growth of pine with numerous boreal and subnemoral mesophytes.

Equiseto hyemalis-Pinetum sylvestris caraganetosum arborescentis Ermakov subass. nova hoc loco
(Table VII: *7*)

Nom. type is relevé nr. 43, Table XIII.
Diagnostic species: *Caragana arborescens* (dom.).

Community with well-developed shrub layer of *Caragana arborescens* and poorly developed herb layer which occurs in the cold bottoms of shallow depressions in the higher river terraces.

Equiseto hyemalis-Pinetum sylvestris chimaphiletosum umbellatae Ermakov subass. nova hoc loco
(Table VII: *8*)

Nom. type is relevé nr. 44, Table XIII.
Diagnostic species: *Carex vaginata, Chimaphila umbellata, Knautia arvensis, Platanthera bifolia, Potentilla erecta, Pyrola rotundifolia.*

Communities of this subassociation occur in meso-oligotrophic sites of the lower sandy terraces of large rivers (the Ob, Tobol) in the West Siberian Plain. In the oligotrophic sites, they are replaced by pine forests of the *Dicrano-Pinion.*

Equiseto hyemalis-Pinetum sylvestris caricetosum macrourae Ermakov, Makunina et Maltseva ex hoc loco
(Table VII: *9*)

Nom. type is relevé nr. 45, Table XIII.
Diagnostic species: *Athyrium filix-femina, Bupleurum aureum, Carex macroura, Heracleum dissectum, Potentilla fragarioides, Vaccinium myrtillus, Veronica chamaedrys, Vicia unijuga.*

These forests replace communities of the previous subassociation in the mesotrophic sites of higher terraces of the Ob river. The mesic and more fertile soils are favorable for development of grass layer with cover of 65-80% and for the growth of numerous mesotrophic species here.

The communities belonging to this subassociation occur at the eastern limit of the order *Calamagrostio-Betuletalia* and are in the contact with the forests of the *Carici macrourae-Pinetalia* in the higher terraces of the Ob river and at the watersheds. That is why they contain transitional floristic features to the letter order.

Similar communities were described by FALINSKI (1995a) on the higher terraces of the Ob river.

Equiseto hyemalis-Pinetum sylvestris betuletosum pendulae Ermakov subass. nova hoc loco
(Table VII: *10*)

Nom. type is relevé nr. 46, Table XIII.
Diagnostic species: *Artemisia armeniaca, Thalictrum foetidum, Viola mirabilis, Cypripedium guttatum, Silaum silaus, Polygonatum humile.*

Community occurring in the higher ancient bank of the Ishim river. The forests belonging to this subassociation occupy the higher parts of the steep slopes of small hills with the xero-mesic sandy loamy soils.

Calamagrostio epigei-Betulion pendulae Korolyuk ex hoc loco
(Table VII: *11-15*)

Nomenclatural type is the association *Cirsio heterophylli-Betuletum pendulae.*
Diagnostic species are European-Siberian mesophytes and hygro-mesophytes: *Betula pubescens, Agrostis gigantea, Crepis sibirica, Filipendula ulmaria, Inula britannica, Lysimachia vulgaris, Moerhingia lateriflora.*

Mesic and hygro-mesic birch (*Betula pendula, B. pubescens*) grass forests with participation of aspen (*Populus tremula*) in the southern part of the forest zone and northern part of forest-steppe zone. The habitats of the forests are characterised by weakly saline, moist and wet soils.

Analogous forest types were characterized by KRYLOV (1961); LAVRENKO (1985).

Poo urssulensis-Betuletum pendulae Korolyuk in Ermakov *et al.* 1991 nom. nud.
(Table VII: *11*)

Diagnostic species of the association are those of the alliance and *Poa urssulensis, Veronica longifolia.*

Typical mesophilous birch forests of the forest-steppe zone. They occur in the lower part of the wide shallow depressions with variable moisture supply.

Phalaroido-Betuletum pendulae Korolyuk ex hoc loco
(Table VII: *12*)

Nom. type is relevé nr. 16 in KOROLYUK and KIPRIYANOVA, 1998 (p.78).
Diagnostic species are hygro-mesophytes of swampy forests and wetlands: *Calamagrostis canescens, Carex riparia, Phalaroides arundinacea, Ptarmica cartilaginea.*

Hygro-mesic birch-aspen grass forests of the wet poorly-drained lower parts of the gentle slopes of closed depressions on the watersheds or wet bottoms of the more shallow depressions.

In the damp sites, the forests are replaced by communities of the class *Alnetea glutinosae.*

Cirsio heterophylli-Betuletum pendulae Korolyuk ex hoc loco
(Table VII: *13-15*)

Nom. type is relevé nr. 6 in KOROLYUK and KIPRIYANOVA, 1998 (p.79).
Diagnostic species are mesophytes and hygro-mesophytes: *Cacalia hastata, Cirsium heterophyllum, C. setosum, Phragmites australis, Viola hirta.*

Birch-aspen grass forests widespread in the southern part of the forest zone (subtaiga subzone). They occupy well-drained undulations with mesic grey soil.

Cirsio heterophylli-Betuletum pendulae aegopodietosum podagrariae Korolyuk ex hoc loco
(Table VII: *13*)

Nom. type of the subassociation is that of the association.
Diagnostic species: *Aegopodium podagraria, Equisetum pratense.*

Community of moist sites.

Cirsio heterophylli-Betuletum pendulae galeopsietosum Korolyuk in Ermakov *et al.* 1991 nom. nud.
(Table VII: *14*)

Diagnostic species: *Artemisia latifolia, Galeopsis bifida, Origanum vulgare, Ranunculus polyanthemos, Seseli libanotis.*

Community of mesic sites.

Cirsio heterophylli-Betuletum pendulae vicietosum sylvaticae Ermakov subass. nova hoc loco
(Table VII: *15*)

Nom. type is relevé nr. 47, Table XIII.
Diagnostic species: *Cypripedium macranthon, Equisetum sylvaticum, Paris quadrifolia, Viburnum opulus, Vicia sylvatica.*

Community of better drained habitats at the western edge of the West Siberian Lowland.

Syntaxonomical notes

Denisova (in ILJINA *et al.*, 1988) described the alliance *Roso majalis-Betulion pendulae* (in the *Querco-Fagetea* class system) of flood-plain forests of the Irtysh river (West Siberian Lowland). Later, this alliance was attributed to the *Brachypodio-Betuletea* by TARAN (1993) despite the absence of distinct features of this class and order.

These are birch (*Betula pendula, B. pubescens*) and pine (*Pinus sylvestris*) forests with poor floristic composition combining a few features of the classes *Querco-Fagetea*, (*Alno-Padion* Knapp 1942), *Salicetea purpurea* Moor 1958 and *Brachypodio-Betuletea* (*Calamagrostio epigei-Betuletalia pendulae*).

At present, the syntaxonomical position of the alliance is unclear and additional data are required.

QUERCO-FAGETEA Br.-Bl. et Vlieger in Vlieger 1937
FAGETALIA SYLVATICAE Pawł. in Pawł. *et al.* 1928
ABIETENALIA SIBIRICAE Ermakov ex hoc loco
(Table VIII)

Nomenclatural type is the alliance *Milio effusi-Abietion sibiricae.*
Differential species: *Abies sibirica, Sorbus sibirica, Aconitum septentrionale, Cacalia hastata, Calamagrostis obtusata, Carex macroura, Cirsium heterophyllum, Corydalis bracteata, Crepis sibirica, Erythronium sibiricum, Euphorbia pilosa, Heracleum dissectum, Lathyrus gmelinii, Pleurospermum uralense, Paeonia anomala, Stellaria bungeana.*

The class *Querco-Fagetea* (*Fagetalia sylvaticae*) is represented in North Asia by Altai-Sayanian mountain relic subnemoral mixed forests, which are the most thermophilous primary communities among Siberian woodlands. These forests are included in the large

geographical group of hemiboreal forests because of the predominance of widespread boreal species in the canopy and at the same time of the essential phytosociological role of nemoral species in the ground layer.

The terms "subnemoral forests" and "hemiboreal forests" are used as synonyms with respect to Siberian Fagetalia forests.

The range of the North Asian Fagetalia forests is not continuous and is located at the periphery of the Altai-Sayanian mountain regin as a result of the special local meso-climates (fig. 4).

The mountains of South Siberia located in the center of Eurasia are weakly influenced by two oceans - the Atlantic Ocean in the west and the Pacific in the east. The main part of the range of subnemoral forests is located in the western and north-eastern foothills of the Altai and Sayani.

High frontal ridges (up to 2000-2500 m) of these mountain systems serve as big barriers on the way of transfer of humid Atlantic air masses from the west. Therefore, the intensive cyclonic processes and considerable softening climatic continentality take place here. As a result, the climate of these marginal mountain regions is characterized by the highest warmth and precipitation indices in Siberia. The average annual temperature is +1 - +30° C, the effective heat sum (above +100) varies from 1700° to 1800°, the Conrad continentality index is 50-70, annual precipitation 900-1300 mm, and annual evaporation (physical and transpiration) 520-560 mm.

The abundant winter precipitation forms a snow cover of up to 1.5 m protecting the soil from the strong frost. In this way, this is the only place in Siberia where minimum soil temperature in winter is above freezing, varying between 0 and +3° (LASHCHINSKY *et al.*, 1991). Microbiological processes resulting in a high intensity of the biological cycle do not stop all winter long. As a consequence, a lack of forest litter is characteristic of the communities of these Siberian subnemoral forests.

Four widespread boreal woody species - *Abies sibirica, Pinus sibirica, Betula pendula* and *Populus tremula* - are dominants and subdominants in the tree layers of the Siberian subnemoral forests in the main part of their range. Of the broad-leaved species, only *Tilia cordata* subsp. *sibirica* occurs in one relict site in the Kuznetsky Alatau ridge. It dominates there and occurs also in the composition of mixed forests, rather far from its range in the South Urals. A peculiarity of the tree layer is its low cover values (40-60%).

The undergrowth of the majority of communities is subdivided into two sublayers The first sublayer is formed by *Sorbus sibirica, Viburnum opulus* and *Padus avium*, assuming the life form of small trees. The second one is formed by shrubs: *Sambucus sibirica, Ribes atropurpureum, R. hispidulum, Caragana arborescens, Spiraea chamaedryfolia.*

A herb layer is always well developed, cover values being 80-100%, richness in species 50-75 for 200 m^2, height up to 80-130 cm, and is subdivided into several sublayers. The layer of the ground mosses has a cover of 5-40% and is represented by usual Eurasian boreal species.

The main basis for classifying Siberian subnemoral forests as belonging to the class *Querco-Fagetea* is predominance of characteristic species of this class and of the order *Fagetalia* over the diagnostic species of other higher units. The characteristic species of the order *Fagetalia* and of subordinate syntaxa predominate in the group (*Actaea spicata, Asarum europaeum, Asperula odorata, Brachypodium sylvaticum, Bromopsis benekenii, Carex sylvatica, Daphne mezereum, Dryopteris filix-mas, Festuca altissima, Festuca gigantea, Geranium robertianum, Lonicera xylosteum, Polystichum braunii, Sanicula europaea, Scrophularia nodosa, Stachys sylvatica, Tilia cordata* subsp. *sibirica, Viburnum opulus, Viola mirabilis*). The majority of these *Fagetalia* species have high constancy indices and some of them are dominants and subdominants in the herb layer. These species have European-Siberian disjunctive relict ranges. The eastern boundaries of the continuous ranges of the majority of the *Fagetalia* species are in the South Urals. There are only four *Querco-Fagetea* and *Fagetalia* species with continuous European-Siberian ranges: *Adoxa moschatellina, Melica nutans, Milium effusum, Paris quadrifolia.* They are widespread in the different types of the southern zonal taiga forests (class *Vaccinio-Piceetea*) of the West Siberian Plain.

The higher values of the constancy and abundance of characteristic *Fagetalia* species make it possible to separate the Siberian subnemoral forests from drier and more continental zonal small-leaved coniferous communities of the class *Brachypodio pinnati-Betuletea* despite of presence of some common Asian regional species. However, some communities of the alliance *Lathyro gmelinii-Pinion sylvestris* of the latter class keep floristic features transitional to the *Querco-Fagetea.*

One of the main peculiarities of the flora of Siberian subnemoral forests is poor participation of the characteristic taiga species of the Eurasian class *Vaccinio-Piceetea.* True taiga species (*Picea obovata, Pyrola rotundifolia, Vaccinium myrtillus, Lycopodium annotinum, Linnaea borealis, Trientalis europaea*) do not play an important phytocoenotic part in subnemoral forests, in spite of the fact that these forests are often in contact with communities of the *Vaccinio-Piceetea.*

Development of spring sinusia of geophytes with cover of 70-80% is typical in Siberia for *Fagetalia* forests. This is a single phytosociological group with a predominance of the Altai-Sayanian endemic species. These Asian spring geophytes have close vicarious species in Europe: *Anemonoides altaica - A. nemorosa, Dentaria sibirica - D. glandulosa, Erythronium sibiricum - E. dens-canis.* Participation of this relict sinusia in the subnemoral forests is an important fact for revealing the close phytosociological and floristic-historical relationships between these forests and current European broad-leaved communities of the class *Querco-Fagetea.*

In parallel with the presence of the distinct features of the class *Querco-Fagetea* and order *Fagetalia*, there are two main differences between Siberian subnemoral forests and their European analogues which are evident in favor of high syntaxonomical status of former:

- absence of some important European broad-leaved species of trees, nemoral species of shrubs and grasses, which are characteristic of the class *Querco-Fagetea* in the main part of their range;
- significant role of subalpine and subalpine-forest tall-forb species in the communities of these forests.

An increase of the phytosociological role of subalpine-forest species *Aconitum septentrionale, Cirsium heterophyllum, Crepis sibirica, Cacalia hastata* is seen in broad-leaved forests in the direction from North Europe to the Urals. The first species of the group appear in the alliances *Fagion* and *Alno-Ulmion* from South Norway (KIELLAND-LUND, 1981). In the South Urals (SOLOMESHCH *et al.*, 1993), the subalpine-forest species together with *Abies sibirica, Pinus sibirica,*

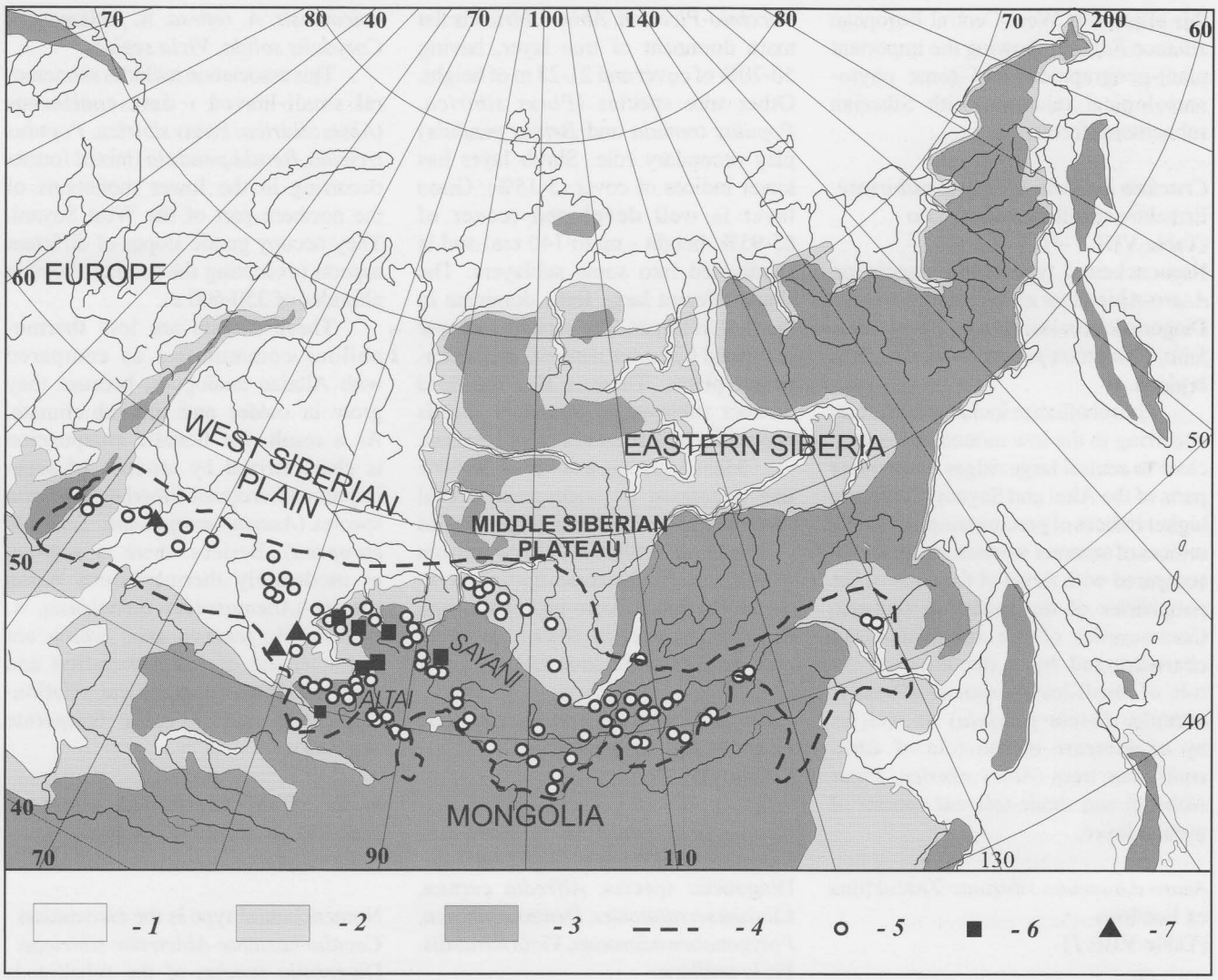

Fig. 4 — Distribution of hemiboreal forests of the classes *Querco-Fagetea* (*Fagetalia sylvaticae*) and *Pulsatillo-Pinetea*. 1 - Plains and lowlands (altitudes of 10-200 m); 2 - Lower plateaus and elevated plains (altitudes of 200-800 m); 3 - Plateaus and mountains (altitudes of 800-4000 m); 4 - Extent of hemiboreal forests; 5-7 - Location of all relevés of hemiboreal forests; 6 - Location of relevés of the *Querco-Fagetea* (*Fagetalia*), 7 - Location of relevés of the *Pulsatillo-Pinetea*.

Bupleurum aureum, Pleurospermum uralense, Crepis sibirica, Cacalia hastata are differential ones of coniferous-broad-leaved forests of the alliances *Aconito septentrionalis-Tilion cordatae* Solomeshch in Solomeshch *et al.* 1993 and *Aconito septentrionalis-Piceion* Solomeshch 1993.

The Altaian subnemoral forests of the *Milio-Abietion sibiricae* and *Filipendulo ulmariae-Populion tremulae* are the most similar to the Ural communities of the alliance *Aconito septentrionalis-Picaeon* and form a single phytosociological and geographical type of amphi-Atlantic subnemoral vegetation. The group of Siberian subalpine-forest species is of great diagnostic importance and reflects regional peculiarities of these forests genesis. These alliances were included in the special suborder *Abietenalia sibiricae* Ermakov 1995 representing the forests of easternmost part of the order *Fagetalia* range in Eurasia.

Siberian *Abietenalia sibiricae* forests are represented by two alliances corresponding to two main phytosociological groups of the forests.

Milio effusi-Abietion sibiricae
Zhitlukhina ex hoc loco
(Table VIII: *1-6*)

Nomenclatural type is the association *Asaro-Abietetum sibiricae*.

Diagnostic species: *Pinus sibirica, Phegopteris connectilis, Diphasium sibiricum, Maianthemum bifolium, Circaea alpina, Rhytidiadelphus triquetrus, Dryopteris expansa, Dryopteris carthusiana, Gymnocarpium dryopteris, Oxalis acetosella*.

The alliance includes shade small-leaved dark-coniferous (*Abies sibirica* - main dominant, *Pinus sibirica, Betula pendula, Populus tremula*) and lime (*Tilia cordata* subsp. *sibirica*) mixed subnemoral forests. They occur in the gentle slopes of various aspects in the lower part of forest belt of the West, North Altai, Sayani and Kuznetsky Alatau at altitudes of 250-1100 m. The shade-tolerant species of ferns (*Phegopteris connectilis, Diphasium sibiricum, Athyrium filix-femina, Dryopteris filix-mas, Dryopteris expansa, Dryopteris carthusiana, Gymnocarpium dryopteris*), nemoral species (*Sanicula europaea, Asperula odorata, Asarum europaeum*) as well as some south-boreal small grasses (*Maianthemum bifolium, Oxalis acetosella*) play leading role in the herb layer. Besides, some subalpine-forest tall-fors (*Aconitum septentrionale, Cirsium heterophyllum, Geranium albiflorum, Bupleurum aureum*) are subdominants and constant species here. The role of the latter is increased in the old communities because of natural disintegration of stands. The alliance *Milio-Abietion* keeps the most distinct features of the order *Fagetalia* among other Siberian forests types. The western analogue of

this alliance is West-Central European alliance *Fagion*, showing the important plant-geographical and some phyto-sociological relations with Siberian subnemoral forests.

Cruciato krylovii-Abietenionsibiricae
Ermakov suball. nova hoc loco
(Table VIII: *1-4*)
Nomenclatural type is the association *Asaro-Abietetum sibiricae.*
Diagnostic species: *Spiraea chamaedryfolia, Cerastium pauciflorum, Cruciata krylovii.*

The suballiance includes the forests occurring in the low mountains located close to central large ridges of the inner parts of the Altai and Sayani. There, the higher indices of precipitation and lower indices of summer warmth are observed compared with those of foothills of the peripheries of the mountain systems. Communities of the suballiance are characterized by a decrease of the role of small-leaved species (*Populus tremula, Betula pendula*) as well as by an increase of the role of dark-coniferous trees (*Abies sibirica, Pinus sibirica*) and shade-tolerant species of ground layer.

Asaro-Abietetum sibiricae Zhitlukhina ex hoc loco
(Table VIII: *1*)

Nom. type is relevé nr. 18, Table XIII.
Diagnostic species are those of the suballiance.

The association was described by ZHITLUKHINA (1988) in the Kyga river basin (North-Western Altai). These fir (*Abies sibirica*) forests with participation of *Pinus sibirica* and *Betula pendula* occur in the lower part of forest belt, on steep (12-25°) slopes of northern, north-western and north-eastern aspects.

Violo biflorae-Abietetum sibiricae
Ermakov ass. nova hoc loco
(Table VIII: *3*)

Nom. type is relevé nr. 46, Table 3 in Ermakov (1995b), p.p. 50, 64-67.

Diagnostic species: *Adenophora liliifolia, Caltha palustris, Euphorbia pilosa, Oreopteris limbosperma, Ranunculus grandifolius, Viola biflora.* These are small-leaved - coniferous mixed forests widespread in the upper part of the subnemoral subbelt in the Altai. They occur on northern gentle (2-5°) slopes at altitudes of 450-1100 m. At higher altitudes, they are replaced by coniferous taiga forests of the class *Vaccinio-Piceetea. Abies sibirica* is the main dominant of tree layer, having 50-70% of cover and 21-28 m of height. Other tree species (*Pinus sibirica, Populus tremula* and *Betula pendula*) play secondary role. Shrub layer has lower indices of cover (5-15%). Grass layer is well developed (cover of 85-95%, height - up to 140 cm) and is subdivided into some sublayers. The shade-tolerant large ferns dominate in the first sublayer. The second sublayer is formed by lower nemoral and south-boreal plants. There is also the third distinct sublayer of abundant *Oxalis acetosella* and *Maianthemum bifolium.*

Moss layer has a cover of 30-60% and is formed by widespread boreal species. Presence of the taiga species (*Vaccinium myrtillus, Lycopodium annotinum, Pyrola rotundifolia*) growing in the local micro-ecotopes: logs, old stumps, etc. is shown in some communities of the association.

Violo uniflorae-Abietetum sibiricae
Ermakov ass. nova hoc loco
(Table VIII: *2*)

Nom. type is relevé nr. 6, Table 2 in ERMAKOV (1995b), p.p. 50, 62-64.
Diagnostic species: *Alfredia cernua, Cirsium serratuloides, Dentaria sibirica, Polygonatum odoratum, Viola mirabilis, Viola uniflora.*

These are fir (*Abies sibirica*) and birch (*Betula pendula*) - fir forests occurring on southern steep (15-35°) slopes at altitudes of 350-900 m. The sites are characterized by moderate moisture regime because of good natural illumination of slopes and soil drenage. These conditions are not favorable for gygro-mesophilous tall-forbs and ferns. Besides, the grass layer has simpler structure and lower indices of richness in species (36-54 species per 200 m^2). *Carex macroura* dominates in grass layer and some xero-mesophilous species (*Polygonatum odoratum, Cirsium serratuloides*) appear. The shallow stony soils of the sites are indicated by a well-developed shrub layer (cover of 35-80%) of facultative petrophytes (*Caragana arborescens, Spiraea chamaedryfolia*) and other shrubs. Moss layer is not developed and is represented by scattered patches of mosses.

Anemonoido baicalensis-Abietetum sibiricae Ermakov et Stepanov in Ermakov 1995
(Table VIII: *5*)

Diagnostic species: *Anemonoides baicalensis, A. reflexa, A. jenisseensis, Corydalis solida, Vicia sepium.*

This association includes subnemoral small-leaved - dark coniferous (*Abies sibirica, Pinus sibirica, Populus tremula, Betula pendula*) mixed forests occurring in the lower mountains of the northern part of the West Sayani. They occupy gentle slopes of different aspects (excepting the southern one) at altitudes of 350-600 m.

These forests are less thermophilous communities as compared with Altaian analogues, because they grow in colder and moister climate. As a result, the floristic composition is characterized by absence of some important European-Siberian *Fagetalia* species (*Asarum europaeum, Sanicula europaea*). Besides, there is a group of moderately thermophilous Asian species (*Anemonoides baicalensis, A. reflexa, A. jenisseensis*) which are characteristic of the association and show its plant-geographical relationships with amphi-Pacific temperate vegetation.

Milio effusi-Abietenion sibiricae
Ermakov suball. nova hoc loco
(Table *5, 6*)

Nomenclatural type is the association *Cacalio hastatae-Abietetum sibiricae.*
Diagnostic species of the suballiance are those of the alliance.

Unlike communities of the *Cruciato krylovii-Abietenion*, these forests occur in the warmer low mountains close to periphery of the Altai and Kuznetskiy Alatau. They keep some transitional features of the alliance *Filipendulo ulmariae-Populion tremulae* – the role of coniferous trees decreases and the role of subalpine-forest tall grasses increases. A diagnostic feature of the suballiance is absence or low constancy of species widespread in the inner parts of the mountain system (*Spiraea chamaedryfolia, Cerastium pauciflorum, Cruciata krylovii*).

Cacalio hastatae-Abietetum sibiricae
Ermakov ass. nova hoc loco
(Table VIII: *6*)

Nom. type is relevé nr. 21, Table 6 in ERMAKOV (1995b), p.p. 54, 73-76.
Diagnostic species: *Caltha palustris, Osmorhiza aristata, Ranunculus monophyllos, Veratrum lobelianum, Viola biflora.*

Communities of this association are widespread in the low mountains of the North-Western Altai in the lower part of the forest belt. They occupy

dominantly northern steep (5-30°) slopes at altitudes of 350-800 m.

The tree layer has medium indices of cover (50-60%) and is characterized by predominance of *Abies sibirica* and rare occurrence of *Pinus sibirica*.

The grass layer has a cover of 80-95% height – up to 180 cm and richness in species - 60-75 per 200 m^2. The medium values of a cover of the tree layer result in an increase of the role of light-demanding subalpine-forest tall-forbs, forming the firsts sublayer. Besides, the shade-tolerant species of the *Milio-Abietion* retain their phytocoenotic importance because of influence of *Abies sibirica* trees on understory.

Geranio robertiani-Tilietum sibiricae Ermakov et Maskayev in Ermakov 1995
(Table VIII: *5*)

Diagnostic species: *Tilia cordata* subsp. *sibirica, Sambucus sibirica, Aegopodium podagraria, Geranium robertianum, Viola uniflora.*

The association includes relic Siberian broad-leaved and broad-leaved-coniferous mixed forests occurring only in the lower part of the western macroslope of the Kuznetsky Alatau ridge only within the territory of 11000 hectares. They grow on steep and gentle slopes (12-20°) of different aspects (dominantly of south-eastern and south-western) at altitudes of 350-550 m.

Tilia cordata subsp. *sibirica* is the main dominant or an important tree which together with *Pinus sibirica, Abies sibirica, Populus tremula, Betula pendula* forms mixed tree layers (height of 21-27 m, cover of 70-90%).

The shrub layer is weakly developed (5-15%).

The grass layer is characterized by higher phytocoenotic role of the thermophilous nemoral species (*Geranium robertianum, Asarum europaeum, Polystichum brauni, Aegopodium podagraria, Festuca altissima*).

Filipendulo ulmariae-Populion tremulae Ermakov all. nova hoc loco
(syn. *Dactylido glomeratae-Abietion sibiricae* Ermakov 1993, 1995 nom. nud.)
(Table VIII: *7-12*)

Nomenclatural type of the alliance is the association *Geranio sylvatici-Populetum tremulae.*
Diagnostic species: *Populus tremula, Delphinium elatum, Polemonium coeruleum, Impatiens noli-tangere, Filipendula ulmaria, Humulus lupulus.*

The alliance includes primary and secondary gygro-mesophilous small-leaved (*Populus tremula*) and coniferous-small-leaved (*Abies sibirica, Populus tremula, Betula pendula*) mixed light forests widespread in the warm ultra-humid foothills of the Altai and Sayani. They occur on gentle slopes of different aspects of hills and low mountains. Inward the mountain system, they occur on southern macroslopes of the lower ridges where they occupy gentle slopes and flat summits. In the shade sites, they are replaced by primary coniferous and mixed forests of the *Milio-Abietion*.

Portion of the *Filipendulo ulmariae-Populion tremulae* forests is secondary communities formed at the place of the former *Milio-Abietion* coniferous forests after antropogenic (clearing) and natural (fire, insects) disturbances.

There are important differences in floristic composition between this alliance and the alliance *Milio-Abietion sibiricae*. Light canopy of the *Filipendulo ulmariae-Populion tremulae* forests, fertile soils and excellent moisture of their sites result in an enormous development of the subalpine-forest tall-forbs forming the special sublayer of height – up to 170-200 cm and cover – 70%. The phytocoenotic role of the shade-tolerant forest herbs and of mosses decreases there.

The *Filipendulo ulmariae-Populion tremulae* forests keep some common features with the European alliance *Alno-Ulmion* because of high constancy of *Festuca gigantea, Impatiens noli-tangere, Equisetum sylvaticum* and sometimes, *Equisetum hyemale*. The main difference between these alliances is high role of North Asian subalpine-forest tall-forbs (diagnostic species of the *Abietenalia sibiricae* and absence of important broad-leaved species of trees in the *Filipendulo ulmariae-Populion tremulae.*

Dactylido-Abietetum sibiricae Ermakov ass. nova hoc loco
(Table VIII: *7*)

Nom. type is relevé nr. 1, Table 7 in ERMAKOV (1995b), p.p. 57, 76-78.
Diagnostic species of the association are those of the alliance *Filipendulo ulmariae-Populion tremulae*

These are fir (*Abies sibirica*) open forests occuring in the foothills of the West Altai (North Eastern Kazakhstan). They occupy northern, north-western and north-eastern slopes of various inclination at altitudes of 500-600 m. Tree layer has lower cover indices (of 40-60%) resulting in formation of the dense tall-forb layer of the light-demanding gygro-mesophytes and mesophytes. This phytocoenotic peculiarity of the *Dactylido-Abietetum sibiricae* forests bring them closer to tall-forb meadows of the class *Mulgedio-Aconitetea* which are spread in the same altitudinal zone and are in close successional relationships with the Siberian *Fagetalia* forests.

Festuco giganteae-Populetum tremulae Ermakov ass. nova hoc loco
(Table VIII: *8*)

Nom. type is relevé nr. 51, Table 8 in ERMAKOV (1995b), p.p. 57, 78-80.
Diagnostic species: *Pinus sibirica, Caragana frutex, Dryopteris expansa, Equisetum hyemale, Oxalis acetosella.*

Small areas of these subnemoral aspen forests occur in the North Altai where they occupy southern gentle (1-5°) slopes of the lower mountains at altitudes of 550-700 m. Most of the communities are secondary at the place of former primary subnemoral dark coniferous forests of the alliance *Milio-Abietion sibiricae*. The floristic composition of the association forests is characterized by combination of light-demanding subalpine-forest gygro-mesophytes and some shade-tolerant forest mesophytes. Besides, presence of young generation of *Abies sibirica* and *Pinus sibirica* points to the gradual restoration of the primary coniferous forests.

Anemonoido jenisseensis-Populetum tremulae Ermakov 1995
(Table VIII: *9*)

Diagnostic species: *Anemonoides baicalensis, A. reflexa, A. jenisseensis, Vicia sylvatica, V. sepium, Viola uniflora.*

These subnemoral aspen communities are spread in the foothills of the West Sayani at altitudes of 300-450 m. There, they form special altitudinal strip of primary small-leaved forests which are replaced by dark coniferous communities of the *Anemonoido baicalensis-Abietetum* (*Milio-Abietion*) at higher altitudes. *Populus tremula* (with single participation of *Abies sibirica*) forms tree layer with a cover of 60-70%. Grass layer has a cover of 85-95% and is subdivided into three sublayers. *Matteuccia struthiopteris* (cover of 25-45%) is the main dominant of the first sublayer (height – up to 140 cm). Subdominants are tall-forbs: *Aconitum*

septentrionale, Cacalia hastata, Cirsium heterophyllum, Pteridium aquilinum. The second layer has lower indices of cover and is formed dominantly by Altai-Sayanian endemic species, *Brunnera sibirica*. The third layer is formed by abundant small plants: *Cruciata krylovii* and *Stellaria bungeana*. Moss layer is not developed and is represented by small patches of mosses.

Equiseto pratensis-Padetum avii Falinski ex hoc loco
(Table VIII: *10*)

Nomenclatural type is relevé 12, Tab. 5 in FALINSKI *et al.*, 1990.
Diagnostic species: *Aegopodium podagraria, Arctium tomentosum, Elymus caninus, Equisetum pratense, Glechoma hederacea, Lamium album, Ranunculus monophyllus, Rosa majalis.*

These bird cherry forests were described by FALINSKI (1990, 1995b) from flood-plain of the Baksha river valley (the south-eastern part of the West Siberian Plain). The small patches of this community occur on the poorly developed inundation terrace along the meandering river bed. *Padus avium* forms a single laeyr of trees. The herb layer is characterised by high role of ferns and moderately thermophilous tall-forb and nemoral species. In original publication this community was identified as belonging to the alliance *Alno-Ulmion*.

Geranio sylvatici-Populetum tremulae Ermakov ass. nova hoc loco
(Table VIII: *11*)

Nom. type is relevé nr. 19, Table XIII.
Diagnostic species: *Aegopodium podagraria, Bupleurum aureum, Geranium sylvaticum, Lathyrus vernus.*

These aspen tall-forb forests occur in foothills of the Salair mountain ridge. They occupy gentle slopes and flat summits of hills and altitudes of 150-300 m.

Aspen forms tree layers of various cover (40-65%). The grass layer is well-developed (mean height of 110 cm, up to of 180 cm) and is formed dominantly of tall-forbs. The lower sublayers of grass layer and moss layer are not developed.

Saussureo latifoliae-Populetum tremulae Ermakov ass. nova hoc loco
(Table VIII: *12*)

Nom. type is relevé nr. 27,
Table XIII.
Diagnostic species: *Allium microdictyon, Caltha palustris, Dryopteris carthusiana, Saussurea latifolia.*

This aspen forests were described in the lower mountains of the northern part of the Kuznetskiy Alatau. They occur on gentle southern slopes with well-developed soils at altitudes of 350-450 m.

Compared to the previous association, these forests are characterized by presence of more shade-tolerant and cryophilous forbs and by more developed shrub layer layer.

PULSATILLO-PINETEA SYLVESTRIS Oberd. 1992
KOELERIO GLAUCAE-PINETALIA SYLVESTRIS Ermakov 1999
(Table IX).

Diagnostic species: *Festuca beckeri, Artemisia scoparia, Koeleria glauca, Carex supina, C. ericetorum, Silene baschkirorum, Gypsophylla altissima, G. paniculata, Jurinea cianoides*. These species are also transgressive characteristic species of the class *Pulsatillo-Pinetea*.

Koelerio glaucae-Pinion sylvestris Ermakov 1999
(Table IX)

Diagnostic species are those of the order.

The class *Pulsatillo-Pinetea* in North Asia is represented by xerophilous psammophilous coniferous (*Pinus sylvestris*) forests. These azonal communities grow in arid and semiarid climates at the southern geographic limit of forests distribution in plains of North Eurasia where they reach the latitude of 49° 50'. These are open monodominant pine forests with poorly developed grass layer consisting dominantly of xerophilous obligate and facultative psammophytes. The class *Pulsatillo-Pinetea* does not have a continuous range. Its communities occur in the composition of azonal "islands" of pine forests scattered over the vast area of steppe and forest-steppe zones from the Ukraine to the Altai foothills. The formation of the forests in the extreme dry climate is conditioned by capacity of pine to use the specific hydrologic regime of sandy substrates as well as by the ability to grow on poor soils. In the West Siberian Plain, the xerophilous pine forests occur locally in the higher sandy terraces of the valleys of large rivers (such as the Irtysh, Ob and Tobol) and on ancient post-Pleistocene fluvial-glacial sandy deposits (fig. 4).

The climate of the territory is dry continental. The average annual temperature is +0.8 - +2.8° C. The temperature of the warmest month (July) is +20 - +21.5° C, the temperature of the coldest month (January) is -15 – -19° C, the effective heat sum (above +10°) is 2000-2200°, the average precipitation is 244-339 mm. Zonal vegetation of the watersheds is represented by the meadow-steppes and dry steppes of the order *Helictotricho-Stipetalia* Toman 1969 (class *Festuco-Brometea*) occurring on chernozem soils. The local peculiarities of distribution of psammophilous pine forests in sandy sites are related with dune relief. Different dune sizes and forms (height of 1-10 m, steepness of slopes of 1-15°) cause a high variation of microecotopes, which are characterized by different degree of fertility and humidity of soils. As a result, certain ecological-topographic series of vegetation are formed on the dune relief. In the steppe and forest-steppe zones, the ecological-topographic series are represented by combination of the mesophilous oligotrophic *Dicrano-Pinion* (Libbert 1933) Matuszkiewicz 1962 forests (*Vaccinio-Piceetea*), mesotrophic xero-mesophilous *Peucedano morisonii-Betulion pendulae* forests (*Brachypodio-Betuletea*), xerophilous psammophilous *Pulsatillo-Pinetea* forests and psammophilous steppes of the *Koelerio-Corynephoretea* Klika in Klika et Novák 1941.

The main reason for classifying of the West Siberian xero-psammophilous grass forests as belonging to the class *Pulsatillo-Pinetea* is predominance of the diagnostic species of this class (MUCINA, 1997; ERMAKOV, 1999b): *Artemisia scoparia, Carex supina, Festuca beckeri, Gypsophylla altissima, G. paniculata, Jurinea cyanoides, Koeleria glauca, Oxytropis campanulata, Potentilla humifusa, Veronica spicata, Silene baschkirorum, Silene chlorantha, Stipa pennata* subsp. *sabuletorum* over those of other higher phytosociological units. These predominantly West Palaearctic xerophilous obligate and facultative psammophytes play an important phytosociological role in the composition of the West Siberian *Pulsatillo-Pinetea* communities and indicate their main ecological, phytosociological and geographical peculiarities.

Besides, there are essential differences between the Central European (OBERDORFER, 1992) and West Siberian *Pulsatillo-Pinetea* forests (ERMAKOV, 1999b). The former grow on dry carbonate slopes of the mountains, in suboceanic climate with weak features

of continentality. The floristic composition of these forests is specified by combination of widespread Eurasian oligotrophic mesophilous boreal species (some of them are characteristic species of the *Vaccinio-Piceetea*) and European (and Eurasian) meso-xerophytes. Thermophilous broad-leaved tree species also occur there. The xerophilous pine forests in sandy sites of the forest-steppe and steppe zones of the West Siberian Plain occur in more arid and continental climate as compared with the Central European *Pulsatillo-Pinetalia* forests. The role of important diagnostic species of the class increases significantly, and the boreal *Vaccinio-Piceetea* species occur rarely in the forests. Furthermore, the numerous thermophilous Central European xeromesophytes and nemoral mesophytes are absent there. The important floristic, phytocoenotic and ecological peculiarities of the West Siberian xerophilous psammophilous pine forests provided the basis for classifying them as special order *Koelerio glaucae-Pinetalia sylvestris* Ermakov 1999. The main peculiarity of the order is identified by a numerous group of xerophilous psammophytes. They make it possible to separate the communities of the class from the widespread boreal coniferous *Vaccinio-Piceetea* and hemiboreal *Brachypodio-Betuletea* forests. The analysis of available Russian and Ukrainian geobotanical literature allows to establish the range of the order *Koelerio-Pinetalia*. The westernmost types of xerophilous psammophilous pine forests carrying distinct characters of this order were described by BELGARD (1954) on higher terraces of the Samara river (East Ukraine). In their composition, the leading role belongs to oligotrophic xerophilous species: *Festuca beckeri, Koeleria glauca, Stipa subulosa, Helichrysum arenarium, Dianthus polymorphus, Centaurea arenaria, Achillea hebleri, Gentiana tinctoria, Cytisus ruthenicus, C. borystenica* and also to oligotrophic mesophytes: *Antennaria dioica, Platanthera bifolia*. Two associations: *Antherico-Pinetum sylvestris* Lavrenko ex Ermakov 1999 and *Potentillo arenariae-Pinetum sylvestris* Lavrenko ex Ermakov 1999 of similar xerophilous pine forests described by LAVRENKO (1973) on the higher terraces of the Donets river (steppe zone of Eastern Ukraine) were included in the order *Koelerio-Pinetalia sylvestris*. Some types of the xerophilous psammophilous forests with distinct features of the order *Koelerio-Pinetalia* were described by SEMENOVA-TAYNSHANSKAYA (1957), RYSIN (1975) and FEDOROVA (1980) on the river terraces of the steppe and forest-steppe zones of European part of Russia. The azonal xerophilous psammophilous pine forests of the steppe and forest-steppe zones of East Europe and West Siberia represent a plant-geographical and phytosociological unity at the syntaxonomic level of the order. They keep common features ecology and common core of flora, consisting of West Palaearctic oligotrophic xerophilous and meso-xerophilous species. The species manifest distinct plant-geographical and syntaxonomic differences between the order *Koelerio-Pinetalia* and the *Pulsatillo-Pinetalia*, as well as between the class *Pulsatillo-Pinetea* and physiognomically similar classes of the boreal *Vaccinio-Piceetea* and hemiboreal *Brachypodio-Betuletea* forests.

The order *Koelerio-Pinetalia* is represented in West Siberia by one alliance *Koelerio-Pinion sylvestris*.

Carici supinae-Pinetum sylvestris Ermakov 1999
(Table IX: *1-27*)

Diagnostic species: *Carex supina, C. praecox, Linaria vulgaris, Dianthus superbus, D. versicolor, Kitagawia baicalensis, Euphorbia subcordata, Arabidopsis bracteata.*

The most xerophilous pine forests of the steppe zone of the West Siberian Plain. They occur on southern, south-western, south eastern gentle slopes (1-2°) and on flat areas of sandy dunes of fluvial-glacial deposits, and higher terraces of the Irtysh river valley between 50° 40'-52° 10'N. These communities are replaced by mesophilous coniferous forests of the *Cladonio-Pinetum* (Caj. 1921) K. Lund 1967 and *Carici ericetorum-Pinetum* Kustova 1988 (the class *Vaccinio-Piceetea*) in the shallow mesic depressions on slopes and in the areas between dunes. At the tops of dunes, they are replaced by psammophilous steppes of the class *Koelerio-Corynephoretea*).

The groups of pines form discontinuous canopy with a cover of 40-60% and height of 19-22 m. The absence of shrub layer is a characteristic feature of the typical association communities. The sparse grass layer has cover of 10-35%, height of 10-25 cm, richness in species of 17-33 species per 200 m^2 and is broken by the areas of exposed soil and forest litter of dry pine needles. Mosses and lichens form small patches or are absent in the ground layer.

Carici supinae-Pinetum sylvestris typicum Ermakov 1999
(Table IX: *1-16*)

Diagnostic species are those of the association.

These are typical communities of the association which occur in the steppe zone.

Variant *Veronica verna* includes forests with the higher role of steppe xerophytes.

Carici supinae-Pinetum sylvestris caraganetosum arborescentis Ermakov 1999
(Table IX: *17-27*)

Diagnostic species: *Caragana arborescens* (dom.), *Oxytropis campanulata, Peucedanum morisonii, Poa urssulensis.*

These xerophilous pine forests are spread in the humider regions of the forest-steppe zone of the south-eastern part of the West Siberian Plain. They occur in the dry oligotrophic sites of convex summits of higher dunes.

Artemisio scopariae-Pinetum sylvestris Ermakov 1999
(Table IX: *28-32*)

Diagnostic species: *Dianthus acicularis, Eremogone longifolia, Erigeron uralensis, Polygonatum odoratum, Psammophylie muralis, Potentilla humifusa, Rumex acetosella, Senecio jacobea, Stellaria graminea, Vincetoxicum hirundinaria.*

These pine forests occur in the forest-steppe zone of the Tobol river basin (western part of the West Siberian Plain). There, they occupy the small upper parts of southern slopes of dunes. In more mesic sites of slopes and in the depressions with mesotrophic soils, they are replaced by mesophilous boreal forests of the alliance *Dicrano-Pinion* and by mesotrophic pine-birch grass hemiboreal forests of the order *Calamagrostio epigei-Betuletalia*.

The communities belonging to this association occur in moister, warmer and less continental climate as compared with the forests of the previous association. It is indicated by a group of East-European-West Siberian moderately thermophilous psammophytes, which are diagnostic species of the association. Most of them grow at the eastern limits of their ranges in West Siberia.

QUERCO MONGOLICAE-BETULETEA DAVURICAE Ermakov et Petelin in Ermakov,1997
QUERCO MONGOLICAE-BETULETALIA DAVURICAE Ermakov 1997
(Table XI: *1-17*)

This class includes continental amphi-Pacific hemiboreal forests of warm and temperate warm Manchurian-Daurian mountain forest-steppe. Their range (fig. 5) is located in the territory of Dauria (the south-eastern part of Siberia), in the continental part of the Russian Far East and North-Eastern China. (In the present study, the available data from the territory of Russia and Mongolia were used for the characteristic of the class).

These are dominantly mixed birch (*Betula platyphylla, B. davurica*), oak (*Quercus mongolica*)-birch mesophilous and xero-mesophilous grass forests. An increase of the role of boreal tree species: *Pinus sylvestris, Larix gmelinii, L. czekanowskii* is related with an increase of the climate continentality and cryophility of sites.

The tree layers of these communities are characterized by a cover of 40-50% and simple structure (without clear differentiation of sublayers).

Shrub and moss layers are poorly developed or are absent.

Open tree layer, good fertility and moderate moisture of soils determine the leading phytocoenotic role of grass layer which has cover of 60-90% and species-richness of 40-75 per 200 m^2.

The characteristic species of the class are Manchurian-Daurian moderately thermophilous xero-mesophytes: *Adenophora sublata, A. pereskifolia, Betula davurica, Calamagrostis brachytricha, Campanula cephalotes, Carex lanceolata, Elymus confusus, Fragaria orientalis, Geranium eriostemon, Iris uniflora, Lilium pensylvanicum, Rosa davurica, Synurus deltoides, Seseli seseliodes, Vicia pseudorobus.*

The differential species are South-Siberian-Manchurian-Daurian plants: *Betula platyphylla, Adenophora tricuspidata, A. coronopifolia, Artemisia integrifolia, Aster tataricus, Potentilla fragarioides, Sedum aizoon, Vicia unijuga, Viola dactyloides.*

The local characteristic species are Daurian ones: *Astragalus membranaceus, Patrinia scabiosifolia, Saussurea elongata.*

The *Querco mongolicae-Betuletea davuricae* forests are geographically vicarious communities in relation to the West-Siberian hemiboreal forests of the *Brachypodio-Betuletea pendulae*. They are characterised by similar physiognomy and occupy similar zonal sites in the south of forest zone and in forest-steppe one. The main differences between these classes are in their floristic compositions. Communities of the *Brachypodio-Betuletea pendulae* were formed synchronologicaly on the base of moderately thermophilous West-Palaearctic (European-Siberian) flora.

The *Querco mongolicae-Betuletea davuricae* forests were formed on the base of moderately thermophilous Eastern-Asian flora and they show strong floristic relations with temperate Eastern-Asian vegetation of the classes *Fagetea crenatae* and *Calamagrostetea langsdorffii* Mirkin in Akhtyamov *et al.* 1985 (*Artemisietalia manschurica* Akhtyamov *et al.* 1985).

The climate peculiarities of the range of the *Querco mongolicae-Betuletea davuricae* are determined by Pacific monsoon. Annual air temperature in Dauria varies from -2° to -4° C, temperature of the coldest month (January) varies from -26° to -29° C, temperature of the warmest month (July) varies from +17° to +20° C, Conrad's continentality index is 79-83, total annual precipitation varies from 330 to 600 mm.

The monsoon precipitation regime is characterized by summer maximum and autumn-winter-spring minimum, about 90% of precipitation being in July and August. Drought in spring and low temperatures in winter resulting in strong freezing of soils are important macroclimatic factors for distribution of the Manzhurian-Daurian hemiboreal forests.

The *Querco mongolicae-Betuletea davuricae* forests are in the contact with thermophilous mesophilous coniferous, broad-leaved subocean forests of the orders *Schizandro-Pinetalia koraiensis* Gumarova 1993 and *Rhododendro-Quercetalia mongolicae* Kim 1990 (the class *Fagetea crenatae*) at the eastern border of their ranges in Manchuria. There are clear floristic and phytocoenotic distinctions between these two classes.

The communities of the class *Fagetea crenatae* unlike the *Querco mongolicae-Betuletea davuricae* forests have complicated pluristratal organisation. Numerous thermophilous Eastern-Asian coniferous and broad-leaved woody species predominate in tree and shrub layers. Grass layer of these forests consists of shadow-tolerant Eastern-Asian nemoral forbs and mesophilous large ferns. Transitional features between communities of these two classes in floristic composition are only observed in more xerophilous oak forests of the *Lespedezo bicoloris-Quercion mongolicae* Gumarova *et al.* 1994 and coniferous broad-leaved forests of the *Jeffersonio-Quercion mongolicae* Kim 1992.

In the western part of the range of the *Querco mongolicae-Betuletea davuricae* (the Selenga river basin), the gradual reduction of the group of diagnostic species of the class (and moderately thermophilous Eastern-Asian mesophytes as a whole) is seen as result of an decrease of influence of the Pacific monsoon.

The replacement of the *Querco mongolicae-Betuletea davuricae* communities by cryo-xerophilous *Rhytidio rugosi-Laricetea sibiricae* forests takes place in the arid, ultra-continental climate of south-western part of the Khentei and in the eastern foot-hills of Khangai.

There are few descriptions of the analogous forest types in the Russian geobotanical literature: PESHKOVA, 1958; RYSIN, 1962; KURENTSOVA, 1967; PANARIN, 1966; LIPATOVA 1969; NOVOSELTSEVA, 1969.

The class includes one order - *Querco mongolicae-Betuletalia davuricae*, consisting of two alliances. These alliances represent two ecological groups of Manchurian-Daurian forests, formed in the sites of different moisture degree and regimes.

Kitagawio terebinthaceae-Betulion davuricae Ermakov 1997
(Table XI: *1-9*)

Diagnostic species are meso-xerophytes, which also occur in East Asian steppes of the class *Cleistogenetea squarrosae* Mirkin *et al.* 1986: *Artemisia gmelinii, A. sericea, Achnatherum sibiricum, Allium splendens, Bupleurum scorsonerifolium, Patrinia rupestris, Poa botryoides, Schizonepeta multifida, Scorzonera radiata* (South-Siberian-Manchurian plant geographical group), *Stellera chamaejasme, Viola gmeliniana* (Manchurian-Daurian plant geographical group), *Aster alpinus, Dendranthema zawadskii, Galium verum, Polygonatum odoratum, Pulsatilla patens* (Eurasian plant geographical group).

These are birch (*Betula davurica, B. platyphylla*), oak (*Quercus mongolica*)-birch and pine (*Pinus sylvestris*)-birch mixed hemiboreal forests of moderately humid and moderately dry sites with the rich loamy (and sometimes sandy) nonfrozen soils. They occur on warm

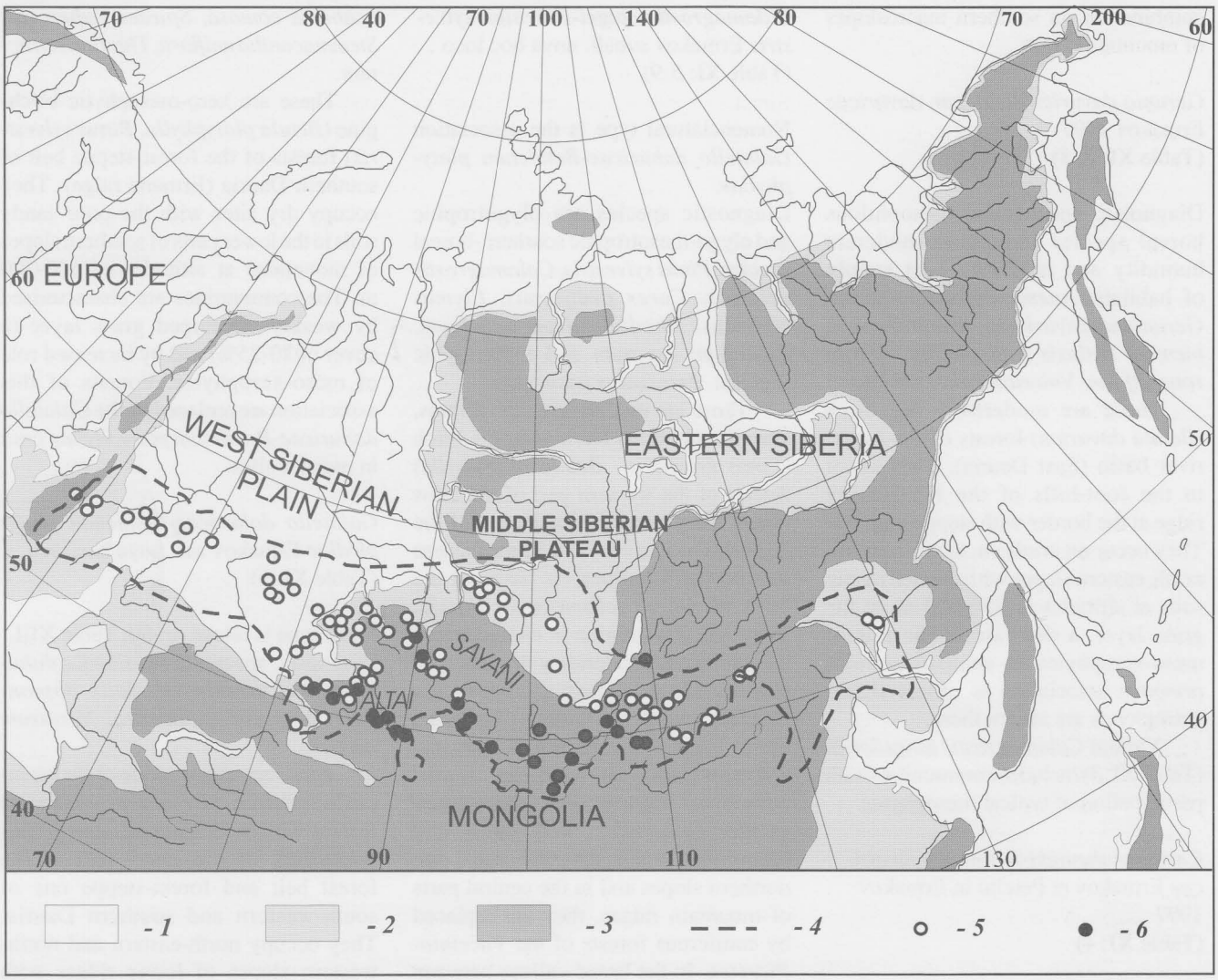

Fig. 5 — Distribution of hemiboreal forests of the class *Querco mongolicae-Betuletea davuricae*. *1* - Plains and lowlands (altitudes of 10-200 m); *2* - Lower plateaus and elevated plains (altitudes of 200-800 m); *3* - Plateaus and mountains (altitudes of 800-4000 m); *4* - Extent of hemiboreal forests; *5, 6* - Location of all relevés of hemiboreal forests; *6* - Location of relevés of the class *Querco mongolicae-Betuletea davuricae*.

western and eastern (sometimes southern) slopes which are characterized by the irregular moisture regime during growth period, at altitudes of 600-1100 m. Everywhere on these slopes they are in a contact with steppes occupying more xeric sites. The alliance includes two suballiances characterizing regional geographical types of hemiboreal forests.

Paeonio lactiflorae-Betulenion davuricae Ermakov suball. nova hoc loco
(Table XI: *1-4*)

Nomenclature type is the association *Geranio davurici-Betuletum davuricae.*

Birch and birch-oak (*Betula davurica, B. platyphylla, Quercus mongolica*) forests of warm continental (eastern) sector of Manchurian-Daurian forest-steppe (middle part of the Amur river basin).

Diagnostic species are thermophilous and moderately mesophilous Manchurian-Daurian species which have western border of their ranges in South-Eastern Siberia (*Carex reventa, Kitagawia terebinthacea, Paeonia lactiflora, Scorzonera albicaulis, Vicia popovii*) and South-Siberian-Manchurian-Daurian meso-xerophilous species: *Bistorta alopecuroides, Hemerocallis minor, Polygonatum humile.*

Artemisio desertorum-Betuletum davuricae Ermakov 1997
(Table XI: *1*)

Diagnostic species are meso-xerophytes and xerophytes which are typical of surrounding Eastern-Asian steppes: *Adenophora gmelinii, Artemisia desertorum, Bupleurum sibiricum, Carex nanella, C. obtusata, Cerastium arvense, Cotoneaster melanocarpus, Dianthus versicolor, Eremogone juncea, Euphorbia fischeriana, Filifolium sibiricum, Hylotelephium triphyllum, Iris humilis, Koeleria cristata, Lespedeza juncea, Phojodicarpus sibiricus, Poa transbaicalica, Potentilla tanacetifolia, Saposhnikovia divaricata, Silene jenisseensis, Spiraea pubescens, S. dahurica, Stemmacantha uniflora, Thalictrum petaloideum, Thesium refractum, Vicia amurensis, Viola dissecta, Youngia tenuifolia.*

These are the most xerophilous birch (*Betula davurica*) forests of the forest-steppe belt of East Dauria. They occupy the upper parts of south-eastern and south-western slopes with the stony soils of lower mountains. Presence of obligate and facultative petrophytes (*Adenophora gmelinii, Orostachys malacophylla, Silene jenisseensis, Woodsia ilvensis, Youngia tenuifolia*) indicate stony soils of sites. These forests are throughout in contact with meadow steppes and form with them typical

combination on southern macroslopes of mountain ridges.

Geranio davurici-Betuletum davuricae Ermakov 1997
(Table XI: *2, 3*)

Diagnostic species are mesophilous boreal species indicating moderate humidity and moderate heat supply of habitats: *Anemonastrum crinitum, Geranium davuricum, Heteropappus biennis, Malaxis monophyllos, Pyrola rotundifolia, Valeriana alternifolia.*

These are moderately dry birch (*Betula davurica*) forests of the Argun river basin (East Dauria). They occur in the foot-hills of the Ishaginskiy ridge at the border with steppe hollows. They occur on northern, north-western, north-eastern slopes with the rich loamy soils at altitudes of 850-900 m. In the grass layer, a decrease of the role of meso-xerophytes in comparison with previous association is observed and petrophytes are absent there.

Variant *Calamagrostis langsdorffii* (Table XI: *3*) includes communities with participation of typical mesophytes.

Carici vanheurcki-Betuletum davuricae Ermakov et Petelin in Ermakov 1997
(Table XI: *4*)

Diagnostic species: *Adenophora triphylla, Artemisia commutata, Calystegia inflata, Carex supermascula, C. vanheurckii, Campanula punctata, Dianthus chinensis, Euphorbia discolor, Geranium orienale, Geranium maximowiczii, Lilium pumilum, Poa ochotensis.*

The association was described in the Zeya river basin (left tributary of the Amur river). These are oak-birch (*Betula davurica, Quercus mongolica*) forests of the eastern part of the Tukuringra ridge. They occupy the warmest sites on steep southern and south-eastern slopes with weakly developed stony soils at altitudes of 250-500 m. Meso-xerophilous species are of minor importance in the communities. Simultaneously, the role of Manchurian-Daurian thermophilous mesophytes, which are diagnostic species of the association increases. The high role of these species is explained by augmentation of heat supply and humidity of the climate in the middle part of the Amur river basin in comparison with the western regions of Dauria.

Calamagrostio epigei-Pinenion sylvestris Ermakov suball. nova hoc loco
(Table XI: *5-9*)

Nomenclatural type is the association *Galatello dahuricae-Betuletum platyphyllae.*
Diagnostic species are olygotrophic and olygo-mesotrophic southern-boreal species: *Pinus sylvestris, Calamagrostis epigeios, Carex pediformis, Elymus sibiricus, Rhododendron dauricum, Rhytidium rugosum* and mesotrophic species: *Astragalus adsurgens.*

These are moderately cryophilous, xero-mesophilous birch and pine-birch (*Pinus sylvestris, Betula platyphylla*) forests of the western part of the class range. They occur in the basins of the Ingoda, Onon rivers and in the eastern part of the Selenga river basin, at the limit of active influence of Pacific monsoon. This region is characterized by continental moderately dry and cold climate. The permafrost and seasonally frozen grounds are widely distributed there. Hemiboreal forests occupy the warmest parts on southern, south-eastern and south-western macroslopes of mountain ridges with sandy and loamy-sandy mesotrophic soils. On northern slopes and in the central parts of mountain ridges, they are replaced by coniferous forests of the *Vaccinio-Piceetea*. In the broad valleys between ridges and on steep southern slopes of the mountains, the suballiance communities are in the contact with steppes. The severe regional climate result in a decrease of amount of the thermophilous Manchurian-Daurian species and impoverishment of floristic composition of these hemiboreal forests at whole. At the same time, an increase of the role of cryophilous boreal and cryo-xerophilous steppe species of Eurasian, North Asian and South-Siberian-Manchurian-Daurian plant geographical groups takes place and indicate some transitional features of the suballiance and geographically neighbouring forests of the *Vaccinio-Piceetea* and *Rhytidio-Laricetea.*

Oxytropido myriophyllae-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table XI: *5*)

Nom. type is relevé nr. 81, Table XIII. Diagnostic species are Manchurian-Daurian and South-Siberian-Manchurian-Daurian meso-xerophytes: *Filifolium sibiricum, Helictotrichon schellianum, Koeleria cristata, Leibnitzia anandra, Lespedeza juncea, Oxytropis myriophylla, Pulsatilla turczaninowii, Scabiosa comosa, Spiraea pubescens, Stemmacantha uniflora, Thesium refractum.*

These are xero-mesophytic birch-pine (*Betula platyphylla, Pinus sylvestris*) forests of the forest-steppe belt of southern Dauria (Ermana ridge). They occupy dry sites with the poor sandy soils in the lower parts of southern slopes of mountains at altitudes of 600-700 m. The communities are characterised by weakly developed grass layer (a cover of 20-25%) and by increased role of meso-xerophytes. Forests of this association are replaced by the *Galatello dahuricae-Betuletum platyphyllae* ones in moister sites.

Galatello dahuricae-Betuletum platyphyllae Ermakov ass. nova hoc loco
(Table XI: *6*)

Nom. type is relevé nr. 80, Table XIII. Diagnostic species are *Galatella dahurica, Poa urssulensis, Salix abscondida, S. pseudopentandra, Veratrum nigrum.*

These are zonal moderately mesophilous birch (*Betula platyphylla*) forests, with participation of pine (*Pinus sylvestris*), of the lower part of the forest belt and forest-steppe one of south-western and southern Dauria. They occupy north-eastern and north-western slopes of lower ridges with sandy soils at altitudes of 800-900 m. At upper border of the forest-steppe belt, they occur in the southern convex parts of gentle slopes at altitudes of 900-1050 m.

Bromopsido pumpellianae-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table XI: *7-9*)

Nom. type is relevé nr. 84, Table XIII. Diagnostic species are: *Aconitum barbatum, Bromopsis pumpelliana, Calamagrostis korotki, Geranium pseudosibiricum, Vaccinium vitis-idaea, Viola arenaria.*

These are moderately mesophilous pine-birch (*Pinus sylvestris, Betula platyphylla*) grass forests with participation of *Larix czekanowskii* and *Populus tremula* which occur in Western Dauria (Yablonovyi, Malakhovskyi, Daurskyi, Tsagan-Daban mountain ridges and in the north-western part of the Khentei). They occur in continental moderately cold climate. Communities belonging to the association occupy the lower parts of southern macroslopes of mountain ridges with sandy mesotrophic soils at altitudes of 800-1100 m. In floristic composition of this association,

the number of Manchurian-Daurian thermophilous species decreases and the role of South-Siberian and North Asian moderately cryophilous xero-mesophilous species, which are diagnostic species of the association increases.

Bromopsido pumpellianae-Pinetum sylvestris typicum Ermakov subass. nova hoc loco
(Table XI: *7*)

Nom. type is relevé nr. 84, Table XIII.
Diagnostic species are those of the association.
Typical community of the association.

Bromopsido pumpellianae-Pinetum potentilletosum longifoliae Ermakov subass. nova hoc loco
(Table XI: *8*)

Nom. type is relevé nr. 82, Table XIII.
Diagnostic species: *Ixeridium chinense, Potentilla longifolia, Kitagawia baicalensis, Polygala sibirica.*
Community of xero-mesic sites.

Bromopsido pumpellianae-Pinetum vaccinietosum vitis-ideae Ermakov subass. nova hoc loco
(Table XI: *9*)

Nom. type is relevé nr. 83, Table XIII.
Diagnostic species: *Pyrola chlorantha, Crepis praemorsa, Thesium repens.*

This community occurs in the most continental climate at the western and north-western borders of the class range. It includes hemiboreal forests with the transitional features of oligotrophic boreal communities of the alliance *Dicrano-Pinion*.

Ligulario fischeri-Betulion davuricae Ermakov 1997
(*Veronicastro sibiricae-Betulion davuricae* Ermakov et Petelin 1997 nom. ambig.)
(Table XI: *10-17*)

Diagnostic species of this alliance belong to different phytosociological and plant geographical groups, however, all of them indicate mesic soils mesotrophic soils: *Aegopodium alpestre, Cacalia hastata, Calamagrostis langsdorffii, Carex pallida, Equisetum pratense, Filipendula palmata, Geranium vlassowianum, Hedysarum alpinum, Ligularia fischeri, Maianthemum bifolium, Moehringia lateriflora, Pedicularis resupinata, Polemonium chinense, Ranunculus japonicus, Solidago dahurica, Thalictrum contortum, Trollius ledebourii, Veronicastrum sibiricum, Vicia venosa* (incl. var. *baicalensis*).

These are birch (*Betula platyphylla, B. davurica*) forests with participation of *Larix gmelinii, Populus tremula*, sometimes *Quercus mongolica* forests of cold humid sites with megatrophic and mesotrophic nonfrozen soils. They occupy small depressions on gentle slopes as well as moist sites in river valleys at altitudes of 600-1100 m. These habitats are characterized by formation of shallow but stable snow cover protecting soil from affect low temperature in winter. During dry spring and early summer, these sites remain moist, but colder in comparison with periodically dry sites of the previous alliance. The combination of mesophilous moderately thermophilous and moderately cryophilous species is typical for the floristic composition of these forests.

Convallario keiskei-Betulenion davuricae Ermakov suball. nova hoc loco
(Table XI: *10-12*)

Nomenclatural type is the association *Veronicastro sibiricae-Betuletum davuricae.*
Diagnostic species are thermophilous mesophytes, which also occur in the Eastern-Asian meadows of the *Artemisietalia mandschurica* (the class *Calamagrostietea langsdorffii*) and in some temperate forests of the *Rhododendro-Quercetalia mongolicae* (the class *Fagetea crenatae*): *Angelica czernaevia, Cimicifuga dahurica, C. simplex, Convallaria keiskei, Polygonatum humile, Sorbaria sorbifolia.*

These are mesophilous, moderately thermophilous birch (*Betula platyphylla, B. davurica*) and mixed forests with participation of *Larix gmelinii, Populus tremula, Quercus mongolica* of the eastern part of the alliance range. These forests occur in the middle part of the Amur river basin where the mesoclimate is determined by the strong influence of the Pacific monsoon. They occupy the humid parts of northern gentle slopes, as well as depressions in the river valleys at altitudes of 300-900 m. In more xeric parts of slopes, the communities belonging to this suballiance are replaced by xero-mesophilous hemiboreal forests of geographically corresponding suballiance *Paeonio lactiflorae-Betulenion davuricae*.

Veronicastro sibiricae-Betuletum davuricae Ermakov 1997
(Table XI: *10*)

Diagnostic species are moderately thermophilous mesophytes: *Carex reventa, Dictamnus dasycarpus, Melica turczaninowiana, Paeonia lactiflora, Pteridium aquilinum, Serratula manshurica, Viola brachysepala, V. collina.*

Primary moist birch (*Betula davurica, B. platyphylla*) and birch-aspen (*Populus tremula*) forests of the Eastern Dauria. These forests occur at summits of small ridges, at altitudes of 1000-1200 m. There, at the upper boundary of forest-steppe belt, they occupy the warmest moist parts of gentle well-drained slopes of south-eastern, south-western and southern aspects, with the rich loamy soils. On shaded slopes and at higher altitudes, they are replaced by taiga of the *Vaccinio-Piceetea*.

This association and the *Geranio davurici-Betuletum davuricae* includes the most typical and widespread hemiboreal forests of East Dauria.

Geranio vlassowiani-Laricetum gmelinii Ermakov 1997
(Table XI: *11*)

Diagnostic species are widespread boreal mesophytes: *Ribes nigrum, Trientalis europaea* and species of Eastern-Asian moist meadows: *Gentiana triflora, Iris sanguinea, Saussurea purpurata, Veratrum lobelianum, Viola sacchalinensis.*

These larch (*Larix gmelinii*), with participation of *Betula platyphylla* and *B. davurica*, hemiboreal forests occur in the moist and moderately cold sites of forest-steppe belt, e.g. in the lower parts of northern gentle mountain slopes, adjacent to the river valleys, at altitudes of 800-850 m. A decrease of thermophilous Manchurian-Daurian mesophytes and xero-mesophytes is seen in the communities, but they are still of phytocoenotic importance. Besides, an increase of the role of Circumboreal and Eurasian cryophytes (*Pyrola rotundifolia, P. incarnata, Trientalis europaea, Vaccinium vitis-idaea*) is observed. In the colder sites, the communities belonging to this association are replaced by light coniferous (*Larix gmelinii*) taiga of the *Vaccinio-Piceetea*.

Aquilegio parviflorae-Quercetum mongolicae Ermakov et Petelin in Ermakov 1997
(Table XI: *12*)

Diagnostic species are Manchurian-Daurian moderate thermophytes: *Adenophora triphylla, Aquilegia parviflora, Aruncus dioicus, Bupleurum longi-*

radiatum, Calamagrostis sugawarae, Campanula punctata, Carex supermascula, C. vanheurckii, Geranium maximowiczii, G. orientale, Gymnademia conopsea, Helictotrichon dahuricum, Saussurea recurvata.

This association was described in the middle part of the Zeya river basin (left tributary of the Amur river). It includes mesophilous moderately thermophilous oak (*Quercus mongolica*) forests with participation of *Betula platyphylla, B. davurica, Populus tremula, Larix gmelinii*. Small stands of these forests occur in the eastern part of the Tukuringra ridge, at the northern border of the *Quercus mongolica* range. They occupy concave sites of south-eastern, south-western and southern gentle slopes with well developed soils at altitudes of 250-350 m. In more stony, steeper and drier parts of the slopes, communities of this asssociation are replaced by the *Carici vanheurcki-Betuletum davuricae* forests.

Bistorto viviparae-Betulenion platyphyllae Ermakov suball. nova hoc loco
(Table XI: *13-17*)

Nomenclatural type is the association *Veronico longifoliae-Laricetum gmelinii.*
Diagnostic species: *Bistorta vivipara, Campanula glomerata, Crepis sibirica, Pleurospermum uralense, Poa sibirica.*

These are mesophylous birch-aspen (*Betula platyphylla, Populus tremula*) grass forests with participation of *Larix gmelinii, L. czekanowskii, Pinus sylvestris* of the western and central parts of Dauria: the Ingoda, Onon rivers basins (the upper part of the Amur river basin) and the eastern part of the Selenga river basin. They occupy the moist moderately cold parts of terraces of the river valleys, gentle slopes of watersheds and mountain slopes adjacent to the river valleys. The regional environments of the suballiance range are determined by a decrease of the influence of monsoons and reduction of the annual temperatures to the west from the Pacific ocean. As a result, a decrease of the role of thermophilous and moderately thermophilous Manchurian-Daurian species and an increase of moderately cryophilous boreal species take place here.

In the drier sites, the suballiance communities are replaced by xero-mesophytic forests of geographically corresponding suballiance *Calamagrostio epigei-Betulenion platyphyllae.*

Veronico longifoliae-Laricetum gmelinii Ermakov ass. nova hoc loco
(Table XI: *13*)

Nom. type is relevé nr. 75, Table XIII. Diagnostic species are mesophytes: *Aconitum ambiguum, Anemonidium dichotomum, Carex schmidtii, Ptarmica alpina, Tephroseris kirilowii, Veronica longifolia.*

Larch-birch (*Larix gmelinii, Betula platyphylla*) mesophilous grass forests of forest-steppe belt of South-Western Dauria (the Onon river basin). They occupy the moist lower parts of the mountain slopes, adjacent to the bogged up river valleys, at altitudes of 800-900 m.

Calamagrostio langsdorffii-Betuletum platyphyllae Ermakov ass. nova hoc loco
(Table XI: *14, 15*)

Nom. type is relevé nr. 76, Table XIII. Diagnostic species are xero-mesophytes indicating periodically dry mesotrophic soils: *Galatella dahurica, Dendranthema zawadskii, Elymus mutabilis, Pulsatilla patens, Scorzonera radiata.*

These are birch (*Betula platyphylla*) forests of the south-western part Dauria (Ermana ridge) which is characterized by cool-temperate monsoon climate. They occupy slopes with the mesic mesotrophic soils at altitudes of 800-1050 m. Combination of mesophilous and xero-mesophilous species is characteristic of their floristic composition due to uneven regime of moisture of soils during growth period. This ecological peculiarity differs the communities of this association from the mesophilous forests of the previous association, which are spread in the moist river valleys and adjacent slopes.

Calamagrostio langsdorffii-Betuletum platyphyllae typicum Ermakov subass. nova hoc loco
(Table XI: *14*)

Nom. type is relevé nr. 76, Table XIII. Diagnostic species are those of the association.

Communities of the upper border of hemiboreal forests. They occupy the gentle, south-eastern and south-western parts of slopes at summits of ridges, at altitudes of 900-1050 m. In the steep and more convex parts of southern slopes they are replaced by more xerophilous communities of the *Galatello dahuricae-Betuletum platyphyllae.*

Calamagrostio langsdorffii-Betuletum artemisietosum sericeae Ermakov subass. nova hoc loco
(Table XI: *15*)

Nom. type is relevé nr. 77, Table XIII. Diagnostic species: *Artemisia sericea, Carex pediformis, Gentiana macrophylla, Elymus komarovii, Poa botryoides.*

This community was described on northern marcoslope of the Ermana ridge where they occupy drained sites at altitudes of 800-900 m.

Vicio venosae-Betuletum platyphyllae Ermakov ass. nova hoc loco
(Table XI: *16*)

Nom. type is relevé nr. 79, Table XIII. Diagnostic species: *Vicia cracca, Trollius asiaticus, Viola uniflora, Calamagrostis obtusata, Thalictrum minus.*

These are mesophilous birch-aspen grass forests of the south-western part of the Baikal region (the eastern part of the basin of the Selenga river). They occur in the sites with mesotrophic, moderately cold soils of moist depressions on gentle slopes and of the narrow river valleys at altitudes of 900-1000 m. These habitats are characterised by formation of stable snow cover protecting soils from deep frozing in the winter. These conditions are favourable for growth of some North-Asian and European-Siberian mesophilous species which are diagnostic ones of the association and are at the eastern limits of their ranges in West Dauria.

Penthaphylloido fruticosae-Betuletum platyphyllae Ermakov ass. nova hoc loco
(Table XI: *17*).

Nom. type is relevé nr. 78, Table XIII. Diagnostic species: *Dianthus superbus, Gentiana macrophylla, Iris sanguinea, Pentaphylloides fruticosa, Salix pyrolifolia, Trisetum sibiricum.*

This association was described in the eastern part of Yablonevyi ridge (Central Dauria). These are birch-larch mesophilous grass forests of the wide river valleys. They occupy moist even sites in the gentle lower parts of south-eastern and south-western mountain slopes adjacent the river valleys, at altitudes of 850-900 m.

RHYTIDIO RUGOSI-LARICETEA SIBIRICAE Korotkov et Ermakov 1999
(syn. *Irido-Laricetea sibiricae* Zhitlukhina et Mirkin 1987 nom. nud.)

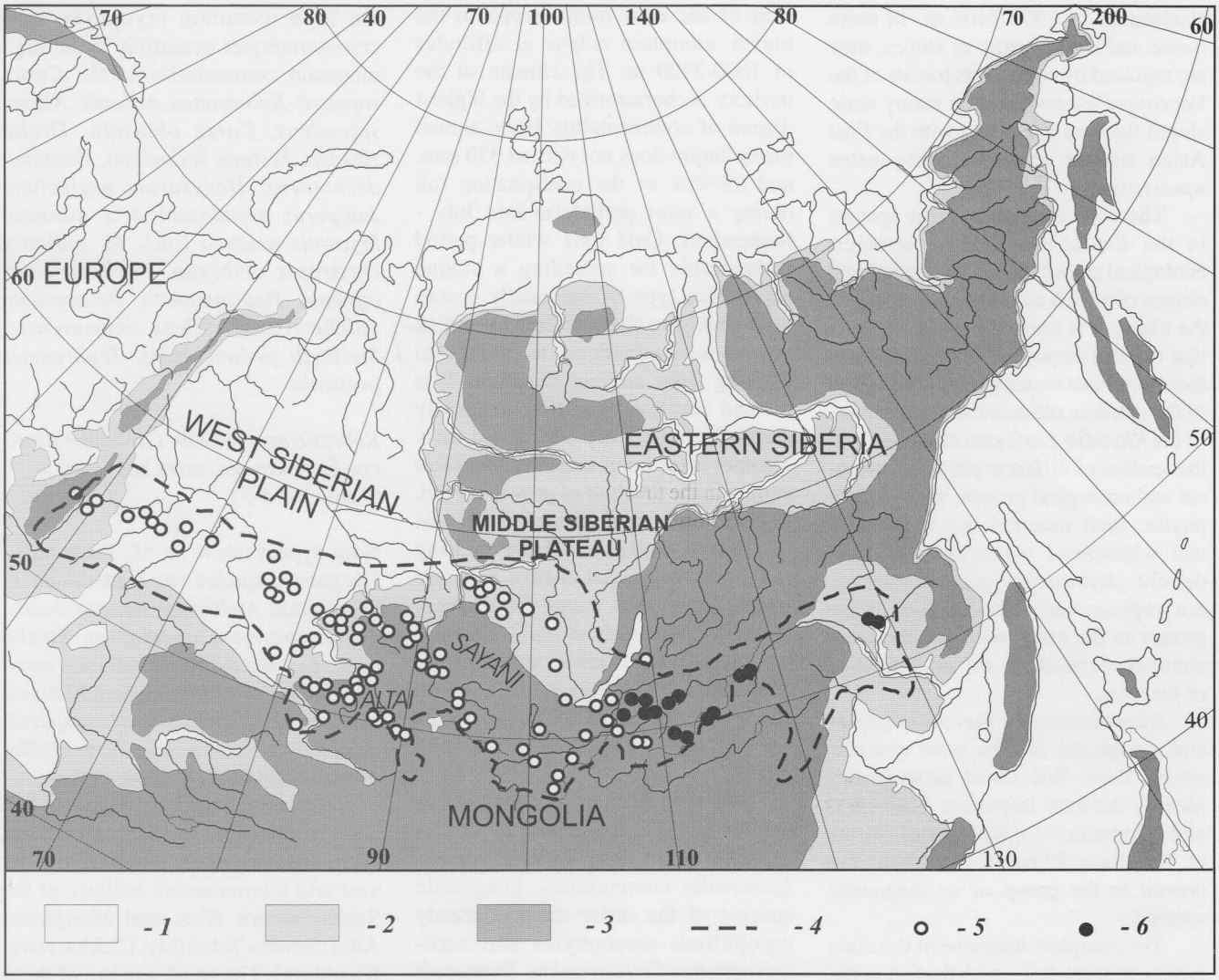

Fig. 6 — Distribution of hemiboreal forests of the class *Rhytidio rugosi-Laricetea sibiricae*. *1* - Plains and lowlands (altitudes of 10-200 m); *2* - Lower plateaus and elevated plains (altitudes of 200-800 m); *3* - Plateaus and mountains (altitudes of 800-4000 m); *4* - Extent of hemiboreal forests; *5, 6* - Location of all relevés of hemiboreal forests; *6* - Location of relevés of the class *Rhytidio rugosi-Laricetea sibiricae*.

Nomenclatural type is the order *Carici pediformis-Laricetalia sibiricae*.
Diagnostic species: *Larix sibirica* (dom.), *Abietinella abietina, Aconitum barbatum, Aster alpinus, Bupleurum multinerve, Carex pediformis, C. kirilowii, Galium verum, Poa sibirica, Potentilla matsuokana, P. nivea, Pulsatilla patens, Rhytidium rugosum, Scorzonera radiata, Thalictrum foetidum.*

The class includes xerophilous and cryo-xerophilous light coniferous hemiboreal forests of ultracontinental climatic sector of the Eurasia. They are widespread in mountain systems of North Mongolia and South Siberia (fig. 6).

The main dominant, *Larix sibirica* is a deciduous light coniferous tree, the most tolerant among other Siberian tree species to the dry cold climate which grow in the sites with seasonally frozen grounds and permafrost. *Pinus sylvestris* also dominates in some *Rhytidio-Laricetea* forests. It takes place only in the warmest, dry, petrophytic and psammophytic sites, at lower altitudes.

The class *Rhytidio-Laricetea* is not a vicarious unit in relation to the *Brachypodio pinnati-Betuletea pendulae* and *Querco mongolicae-Betuletea davuricae*. All these classes are characterized by different floras and different ecology. Only European xerophilous pine forests of the *Erico-Pinetea* Horvat 1959 and *Pulsatillo-Pinetea* can be considered as western ecological analogues of the *Rhytidio-Laricetea*.

In the North Altai and North Sayani, the ranges of the *Rhytidio-Laricetea* and *Brachypodio-Betuletea* geographically coincide, but, there, the communities of these classes occupy different sites within common landscapes. The xerophilous larch (sometimes pine) forests occur in more xeric sites, and are in intermediate position in ecological sets between steppes *Festuco-Brometea* (sometimes *Cleistogenetea squarrosae*) and mesophilous grass forests of the *Brachypodio-Betuletea*. That is why in these regions, there are various transitional forest types with combinations of mesophytes and xerophytes in parallel with typical forests of the two classes. Similar regularities are found in the eastern part of range of the class *Rhytidio-Laricetea*. There, they occupy dryer sites in comparison with the amphi-Pacific mesophytic *Querco mongolicae-Betuletea davuricae*.

Complete geographical replacement of the *Brachypodio-Betuletea pendulae* and *Querco-Betuletea davuricae* by the *Rhytidio-Laricetea* forests is seen as result of an increase of aridity and cryophility of climate in the Khangai, Mongolian Altai and South-Western Khentei. There, the hemiboreal larch forests occur in the ultracontinental arid climate, in the sites with cold soils,

at altitudes of 1900-2400 m. In more mesic and shaded parts of slopes, they are replaced by coniferous forests of the *Vaccinio-Piceetea,* and on sunny xeric slopes they are in contact with the East Asian steppes of the *Cleistogenetea squarrosae.*

There are no characteristic species in the *Rhytidio-Laricetea*, species, ecological amplitudes and geographical ranges of which coincide with those of the class. It is connected with the fact that the thermophilous and moderately thermophilous mesophytes cannot grow in the extreme ultracontinental climate. In the *Rhytidio-Laricetea* communities, the species of different phytosociological and ecological groups: steppe xerophytes, high mountainous cryophytes and widespread mesophytes without definite phytosociological coincidence are represented. The role of these groups in the associations of the class changes depending on peculiarities of the sites.

Nevertheless, the meso-xerophytes and xerophytes are the most constant groups there. Species of these groups identify the most important ecological and phytosociological peculiarities of the class *Rhytidio-Laricetea* and prevail in the group of its diagnostic species.

The complete diagnose of the class is done in accordance with the following

- absence or lower phytocoenotic role of characteristic and diagnostic species of the geographically neighboring classes: *Vaccinio-Piceetea*, *Brachypodio-Betuletea pendulae* and *Quercо-Betuletea davuricae*;

- simple in structure, monodominant open tree layer of *Larix sibirica* (sometimes of *Pinus sylvestris* - in petrophytic sites).

Similar communities were reported from South Siberia and Mongolia by YUNATOV (1950); DUGARZHAV *et al.* (1975); BANNIKOVA (1978); KOROTKOV (1978); HILBIG and KNAPP (1983); PACYNA (1986); LAVRENKO *et al.* (1983); MASKAEV (1985); MIRKIN *et al.* (1988); HILBIG (1990, 1996); ERMAKOV *et al.* (1992).

FESTUCO OVINAE-LARICETALIA SIBIRICAE I.Korotkov et Ermakov ex hoc loco
(Table XI)

Nomenclatural type is the alliance *Festuco altaicae-Laricion sibiricae.*

Cryophilous xero-mesophilous hemiboreal larch forests of North Mongolia and adjacent areas of South Siberia. They are spread as a component of the cold forest-steppe in the higher mountain ridges at altitudes of 1600-2400 m. The climate of the territory is characterized by the highest degree of continentality. Here, annual precipitation does not exceed 350 mm, and 88-95% of the precipitation fall during a short period (in late July - September). Cold long winter period is favorable for spreading a unique Mongolian type of seasonally frozen soils which are characterized by a thick ground ice layer (down to 30-50 cm) forming from autumn moisture. This ground ice layer melting gradually during extremely dry spring and early summer is the main source of the water supply in the first half of growth period. The canopies and ground layers of the forests delay soil frost melting and promote gradual change moisture regime in the sites. Large disturbances of the forests result in rapid warming of the soils and loosing the moisture of the higher soil layers. As a result, the *Festuco ovinae-Laricetalia* forests are replaced by steppes for a long period.

The variable soil heat and moisture is favourable for the growth of species of different ecology in the *Festuco-Laricetalia* communities. Diagnostic species of the order are moderately cryophilous mesophytes and xero-mesophytes: *Festuca ovina, Bromopsis pumpelliana, Dianthus superbus, Carex amgunensis, Bistorta vivipara, Trisetum sibiricum, Lonicera altaica.*

In the *Festuco ovinae-Laricetalia* forests, there is a moss layer consisting of xerophilous species which causes physiognomic similarity of the *Festuco-Laricetalia* and *Vaccinio-Piceetea.* This is the main reason for the name "pseudotaiga" for the *Festuco-Laricetalia* forests in Russian and Mongolian geobotanical literature.

Pachypleuro alpini-Laricion sibiricae Ermakov all. nova hoc loco
(Table XI: *5-10*)

Nomenclatural type is the association *Kobresio myosuroidis-Laricetum sibiricae.*

These the most cryophilous hemiboreal larch forests are spread in the transitional altitudional strip between steppes and high mountain vegetation (2000-2400 m) in the south-eastern part of the Russian Altai and Mongolian Altai. The sites are characterized by the coldest temperature regime and variation of moisture of soils during the growth period.

Differential species of the alliance are high mountain cryophytes and cryo-xerophytes occurring in the high mountain communities of the *Carici rupestris-Kobresietea bellardi*: *Allium splendens, Carex obtusata, Draba sibirica, Festuca kryloviana, Gentiana decumbens, Hedysarum neglectum, Juniperus pseudosabina, J. sibirica, Myosotis asiatica* (incl. *M. imitata*), *Oxytropis ambigua, Pachypleurum alpinum, Poa attenuata, Polemonium pulcherrimum, Silene chamarensis, Stellaria peduncularis, Tephroseris praticola.*

Kobresio myosuroidis-Laricetum sibiricae Ermakov ass. nova hoc loco
(Table XI: *5-7*)

Nom. type is relevé nr. 51, Table XIII. Diagnostic species are high mountain cryophytes: *Androsace septentrionalis, Aulacospermum anomalum, Draba cana, Festuca rubra, Hedysarum inundatum, Helictotrichon hookeri, Kobresia myosuroides, Pedicularis compacta, Pedicularis lasiostachys, P. verticilla, Primula algida, Saussurea alpina.*

The communities belonging to this association occur in the upper parts of mountain ridges surrounding the vast arid intermountain hollows of the South-Eastern Altai and Mongolian Altai (Severo-Tchuiskiy, Chikhachova, Kharkhira). The small patches of these forests surrounded by cryophytic steppes and high mountain vegetation occupy the northern parts of slopes at altitudes of 2200-2400 m (up to 2600 m).

Kobresio myosuroidis-Laricetum sibiricae typicum Ermakov subass nova hoc loco
(Table XI: *5*)

Nom. type is relevé nr. 51, Table XIII. Diagnostic species are those of the association.

Typical communities of the association.

Kobresio myosuroidis-Laricetum sibiricae dryadetosum oxyodontae Ermakov subass. nova hoc loco (Table XI: *6*)

Nom. type is relevé nr. 52, Table XIII. Diagnostic species: *Arctous erythrocarpa, Astragalus alpinus, Dryas oxyodonta, Ranunculus monophyllus, Trisetum spicatum.*

These cryophilous larch grass forests were described in the northern part of the association range (the Altai, Severo-Tchuisky ridge). They occur at the upper boundary of the forest belt at altitudes of 2200-2400 m.

Kobresio myosuroidis-Laricetum sibiricae hedysaretosum inundati Ermakov subass. nova hoc loco
(Table XI: *7*)

Nom. type is relevé nr. 53, Table XIII.
Diagnostic species: *Astragalus frigidus, Gentianella amarella, Melilotoides ruthenica, Peucedanum vaginatum, Pulsatilla turczaninovii, Saxifraga hirculus.*

These cryophilous xero-mesophilous larch grass forests were described in the southern part of association range (the Mongolian Altai and Kharhira mountains). Small areas of these forests occur on northern slopes, in the transitional altitudinal strip between steppe and high-mountain vegetation (2200-2500 m).

Spiraeo chamaedryfoliae-Laricetum sibiricae Ermakov ass. nova hoc loco
(Table XI: *8-10*)

Nom. type is relevé nr. 54, Table XIII.
Diagnostic species are moderately thermophilous mesophytes growing at their altitudional limits: *Aquilegia sibirica, Campanula rotundifolia, Caragana arborescens, Cotoneaster uniflorus, Elymus sajanensis, Moehringia lateriflora, Pedicularis elata, Thesium repens.*

These hemiboreal forests are spread in the less arid and continental climate than communities of the previous association. They were described in the southern macroslope of Kuraisky and Severo-Tchuisky ridges (the south-eastern part of the Altai). These forests occur on steep northern, north-eastern and north-western slopes of southern macro-slopes of the higher mountains at altitudes of 2000-2200 m.

Spiraeo chamaedryfoliae-Laricetum sibiricae cicerbitetosum azureae Ermakov subass. nova hoc loco
(Table XI: *8*)

Nom. type is relevé nr. 53, Table XIII.
Diagnostic species: *Aconitum altaicum, Cicerbita azurea, Heracleum dissectum, Ribes nigrum.*

The community occurs in the sites with periodically excessive flow moisture.

Spiraeo chamaedryfoliae-Laricetum sibiricae colurietosum geoidis Ermakov subass. nova hoc loco
(Table XI: *9*)

Nom. type is relevé nr. 54, Table XIII.
Diagnostic species: *Allium nutans, A. strictum, Artemisia obtusiloba, Astragalus adsurgens, Coluria geoides, Cotoneaster melanocarpus, Dianthus versicolor, Helictotrichon schellianum, Koeleria altaica, Serratula marginata, Veronica porphyriana,*

The community occurs on dry convex slopes at the boundary with steppes.

Spiraeo chamaedryfoliae-Laricetum sibiricae empetretosum nigri Ermakov subass. nova hoc loco
(Table XI: *10*)

Nom. type is relevé nr. 56, Table XIII.
Diagnostic species: *Bergenia crassifolia, Bistorta major, Empetrum nigrum, Pedicularis compacta, Pinus sibirica.*

The community occurs in cold moist depressions on shaded slopes with permafrost. This is transitional type of hemiboreal forests to the taiga *Vaccinio-Piceetea.*

Irido ruthenicae-Laricion sibiricae Ermakov all. nova hoc loco
(Table XI: *1-4*)

Nomenclatural type is the association *Thesio repentis-Laricetum sibiricae.*
Diagnostic species: *Artemisia macrantha, Caragana arborescens, Elymus sajanensis, Gentiana macrophylla, Hylocomium splendens, Iris ruthenica, Paeonia anomala, Poa urssulensis, Viola arenaria.*

These are moderately cryophilous larch grass forests of semiarid climatic sector of the South Siberian mountain systems. They are spread in the forest-steppe belt of higher mountain ridges, surrounding arid intermountain hollows (Kuraiskaya, Ubsu-Nuurskaya). These forests occupy steep and gentle slopes of different aspects (except the southern one), which face to the hollows, at altitudes of 1600-1900 m. The soils of the sites are frozen during winter and part of the warm season, but unlike habitats of the *Pachypleuro alpini-Laricion sibiricae* they are outside the permafrost zone. As a result, phytocoenotic role of some moderately cryophilous and moderately thermophilous species increases.

Thesio repentis-Laricetum sibiricae Ermakov 1996
(Table XI: *1-4*)

Diagnostic species are those of the alliance.

At present, this is the sole association of the alliance *Irido-Laricion.* The *Thesio repentis-Laricetum* forests occur at the north-western geographical limit of the *Rhytidio-Laricetea* range. They are replaced by ampi-Atlantic hemiboreal forests of the alliance *Vicio unijugae-Pinion sylvestris* (the *Brachypodio-Betuletea*) in the more warm and humid adjacent regions of the Altai and Sayani.

Thesio repentis-Laricetum sibiricae typicum Ermakov 1996
(Table XI: *1*)

Diagnostic species: *Vicia nervata, Picea obovata, Viola dissecta.*

These larch grass forests were described on the southern macroslope of the Khorumung-Taiga ridge (the south-eastern part of Tuva). They occupy the north-eastern and north-western steep slopes at altitudes of 1600-1900 m.

Thesio repentis-Laricetum sibiricae rosetosum pimpinellifoliae Ermakov subass. nova hoc loco
(Table XI: *2*)

Nom. type is relevé nr. 48, Table XIII.
Diagnostic species: *Vaccinium vitis-idaea, Spiraea media, Rosa pimpinellifolia, Allium strictum.*

These are typical larch grass grass forests of the forest-steppe belt of the Severo-Tchuiskaya intermountain basin (the south-eastern part of the Altai). They occupy northern gentle slopes of foot-hills of the ridges surrounded the steppe intermountain basin at altitudes of 1700-1900 m.

Thesio repentis-Laricetum sibiricae adenophoretosum lamarcki Ermakov subass. nova hoc loco
(Table XI: *3*)

Nom. type is relevé nr. 49, Table XIII.
Diagnostic species: *Adenophora lamarckii, Anemone sylvestris, Artemisia santolinifolia, Elytrigia gmelinii, Rhododendron dauricum, Stellaria bungeana.*

These forests replace the communities of the previous subassociation on the drier convex eastern and western slopes.

Thesio repentis-Laricetum sibiricae hedysaretosum neglecti Ermakov subass. nova hoc loco
(Table XI: *4*)

Nom. type is relevé nr. 50, Table XIII.
Diagnostic species: *Astragalus pendulinus, Geranium albiflorum, Melilotoides platycarpos, Pleurozium schreberi,*

Solidago virgaurea.

These forests occur on southern macroslope of the Kuraisky ridge (the South-Eastern Altai). They occupy well-drained moist depressions on eastern and western slopes at altitudes of 1800-1900 m.

Festuco altaicae-Laricion sibiricae I.Korotkov et Ermakov ex hoc loco (Table XI: *11-23*)

Nomenclatural type is the association *Festuco altaicae-Laricetum sibiricae.* Diagnostic species: *Anemonastrum crinitum, Artemisia laciniata, Campanula turczaninovii, Dendranthema zawadskii, Lathyrus humilis, Pedicularis rubens, Sanguisorba officinalis, Valeriana alternifolia, Vicia cracca.*

These xero-mesophilous larch forests are widespread in the mountain forest-steppe of the Khangai and Khentei (North Mongolia). They occupy northern slopes with the seasonally frozen soils at altitudes of 1600-2400 m.

The alliance forests are characterized by an increase of the role of meadow and meadow-steppe plants which predominate in the group of diagnostic species.

Festuco altaicae-Laricenion sibiricae I.Korotkov et Ermakov ex hoc loco (Table XI: *11-16*).

Nomenclatural type is the association *Festuco altaicae-Laricetum sibiricae.* Diagnostic species are moderately cryophilous high mountain and boreal ones: *Calamagrostis pavlovii, Cerastium pauciflorum, Festuca altaica, Ranunculus propinquus, Saussurea stubendorffii.*

These are typical communities of the alliance which occur in the western and central parts of the Khangai and mountains of the Khubsugul region.

Festuco altaicae-Laricetum sibiricae I.Korotkov et Ermakov ex hoc loco (Table XI: *11, 12*)

Nom. type is relevé nr. 58, Table XIII. Diagnostic species are those of the suballiance.

These are cryophilous xero-mesophilous larch forests which represent a core of widespread "pseudotaiga" forest type in North Mongolia. They occupy northern slopes with the moderately mesic, seasonally frozen soils in the central parts of the higher mountain ridges at altitudes of 1800-2200 m.

Festuco altaicae-Laricetum sibiricae typicum Ermakov subass. nova hoc loco (Table XI: *11*)

Nom. type is relevé nr. 58, Table XIII. Diagnostic species are those of the association. Typical communities of the association.

Festuco altaicae-Laricetum sibiricae delphinietosum crassifolii Ermakov subass. nova hoc loco (Table XI: *12*)

Nom. type is relevé nr. 59, Table XIII. Diagnostic species: *Delphinium crassifolium, Heracleum dissectum, Lilium pilosiusculum.*

These forests occur in well-drained sites with more moist soils (shallow depressions on northern slopes).

Poo sibiricae-Laricetum sibiricae Pacina ex hoc loco (Table XI: *13*)

Nom. type is relevé nr. 60, Table XIII. Diagnostic species: *Aconogonon angustifolium, Cerastium arvense, Pedicularis amoena, Poa transbaicalica, Pulsatilla ambigua, Ranunculus pedatifidus, Rhodiola rosea, Saxifraga sibirica, Tephroseris integrifolia.*

The relevés of the forests were represented in the synthetic table by PACINA (1986). These "pseudotaiga" larch grass forests are spread in the southern part of the Central Khangai (Tarbagatai ridge). They occur in the arid climate in the sites with seasonally frozen soils on permafrost at altitudes of 2200-2400 m. There, they are at the southern limit of the *Rhytidio-Laricetea* range in Mongolia. The combination of cryophytes and xerophytes is typical for these forests occurring in the extreme ultracontinental climate, and indicates cold xeric conditions of their sites.

Pentaphyllo fruticosae-Laricetum sibiricae Mirkin *et al.* 1986 (Table XI: *15*)

Diagnostic species: *Geranium transbaicalicum, Pentaphylloides fruticosa, Ribes rubrum.*

The association was described by MIRKIN *et al.* (1986) in the Khangai. These are grass larch forests of the river valleys. They are characterized by impoverished floristic composition because of grazing which is typical of this type of sites. HILBIG (1996) attributed to the association eight relevés of heavily grazed larch forests on screes formed by mountain streams in West Mongolia. However, those forests are closer to the alliance *Irido-Laricion* and probably, they could be included to a particular association of the latter alliance.

Fragario orientalis-Laricenion sibiricae Ermakov suball. nova hoc loco (Table XI: *17-23*)

Nomenclatural type is the association *Vicio unijugae-Laricetum sibiricae.* Diagnostic species: *Betula platyphylla, Artemisia sericea, Carex lanceolata, Dracocephalum grandiflorum, Elymus gmelinii, Fragaria orientalis, Geranium eriostemon, Polemonium chinense, Saussurea elongata, Viola uniflora*

These are moderately cryophilous larch and birch-larch (*Betula platyphylla, Larix sibirica*) grass forests of the Khentei and the eastern part of the Khangai. The climate of the territory is more mild than that of the Central Khangai and Mongolian Altai and the habitats of the forests are characterized by seasonally frozen soils without permafrost. The communities belonging to this suballiance occur in the lower part of the forest belt and in the forest-steppe one at altitudes of 1700-2000 m. In the upper part of the mountain ridges, they are replaced by coniferous taiga forests of the *Vaccinio-Piceetea.* Appearance of the moderately thermophilous Manchurian-Daurian and North Asian species is the main peculiarity of the floristic composition of the *Fragario-Laricenion* forests. Communities of the suballiance are spread at the south-eastern geographical limit of the *Festuco-Laricetalia* range. In more warm and humid adjacent lower mountain regions of the West Dauria and East Khangai, they are replaced by cool-temperate amphi-Pacific forests of the *Querco-Betuletea davuricae.*

Geranio pseudosibiricae-Laricetum sibiricae Hilbig (1987) 1990 (Table XI: *17-21*)

Diagnostic species: *Aegopodium alpestre, Equisetum pratense, Ranunculus japonicus, Trollius asiaticus, Vicia venosa* (incl. var. *baicalensis*).

The association was described by HILBIG (1990, 1996) and included different ecological types of hemiboreal forests of the North Mongolia (without definition of their position in the system of higher syntaxonomical units). All diversity of these forests was represented by six subassociations and variants.

In the present study, the association *Geranio-Laricetum* has been included into the *Rhytidio-Laricetea* in the smaller syntaxonomical volume. It is represented by three subassociations. Their detailed characteristics as variants have been made in HILBIG's papers (1990, 1996). Only diagnostic indications are presented here. The species indicating the moderately moist, moderately cold environments of sites were included in the diagnostic species group.

Two syntaxa described by HILBIG, 1990 as variants of the subassociatons *Geranio pseudosibiricae-Laricetum sibiricae aconitetosum barbati*, var. *Kobresia bellardi* (Table XI: *14*) and var. *Stellaria bungeana* (Table XI: *16*) have higher syntaxonomical ranks. They were described from the colder and more continental regions of the Central Khangai and Khubsugul. Perhaps, they could be placed at the association rank in the suballiance *Festuco altaicae-Laricenion sibiricae*. However, the additional data are required for the problem solution.

Geranio pseudosibiricae-Laricetum sibiricae aconitetosum barbati Hilbig 1990, 1996
(Table XI: *17, 18, 19*)

Diagnostic species are those of the association.

Variant typical (Table XI: *17*) includes typical community of the subassociation.

Variant *Crepis sibirica* (Table XI: *19*) includes more mesophilous forests.

Variant *Geranium eriostemon* (Table XI: *18*) includes communities of the former association *Vicio venosae-Laricetum sibiriace* I. Korotkov *et al.* in Ermakov *et al.* 1992 nom. nud. These are larch forests of the lower part of the forest-steppe belt of the South-Western Khentei. They are characterized by an increase of the role of Manchurian-Daurian species.

Geranio pseudosibiricae-Laricetum sibiricae cacalietosum hastatae Hilbig 1990 (1996)
(Table XI: *20*)

Diagnostic species: *Aconitum turczaninovii, Aconitum septentrionale, Senecio nemorensis, Cacalia hastata, Calamagrostis langsdorffii* incl. *C. purpurea, Artemisia frigida.*

These are forests of moderately cold, humid sites.

Geranio pseudosibiricae-Laricetum sibiricae calthetosum palustris Hilbig 1990 (1996)
(Table XI: *21*)

Diagnostic species: *Caltha palustris, Carex orbicularis, Hedysarum inundatum, Pedicularis oederi, Ranunculus monophyllus, Saxifraga hirculus, S. punctata.*

These are forests occurring in the sites with periodically excess moisture of soils.

Betulo platyphyllae-Populetum tremulae Hilbig 1990 (1996)
(Table XI: *22*)

Diagnostic species: *Populus tremula, Elymus mutabilis, Rubus saxatilis, Sedum aizoon.*

The association was described by HILBIG (1990) from North-Eastern Mongolia. We included it in the *Rhytidio-Laricetea* in the original syntaxonomic volume. This is the only association belonging to the order *Festuco-Laricetalia* with predominance of the small-leaved tree species, for which the Mongolian ultracontinental climate is unfavourable. *Betula pendula* and *Populus tremula* occur here at the southern limits of the ranges.

The communities of the *Betulo platyphyllae-Populetum tremulae* are characterized by poorer floristic composition in comparison with the physiognomicaly similar birch-aspen hemiboreal forests belonding to the class *Querco mongolicae-Betuletea davuricae* which occur in the more warm and humid adjacent regions of the West Dauria because of reduction of the role of thermophilous Manchurian-Daurian species.

Vicio unijugae-Laricetum sibiricae Ermakov, I. Korotkov et Laletin ex hoc loco
(Table XI: *23*)

Nom. type is relevé nr. 57, Table XIII.
Diagnostic species are moderately thermophilous xero-mesophytes: *Adenophora lamarckii, Astragalus membranaceus, Elymus dahuricus, Myosotis sylvatica, Vicia unijuga.*

These xero-mesophilous grass forests are widespread in the forest-steppe belt of the Khentei. They occupy western and eastern moderately dry convex slopes at altitudes of 1500-1700 m. The soils of their sites are seasonally frozen, but with shorter period of melting in comparison with those of the forest-steppe belt of the East Khangai.

Irido-Laricetum sibiricae Mirkin in Mirkin *et al.* 1988

The association was described (MIRKIN *et al.*, 1988) from the forest-steppe belt of the North-Eastern Khangai. In this paper, B. Mirkin for the first time supposed the existence of the special class of Siberian and Mongolian grass forests – the present class *Rhytidio-Laricetea sibiricae*.

These are poor in floristic composition communities (18-23 species per plot) of larch forests occurring in the northern and north-western slopes at altitudes of 1800-1910 m.

Cypripedio guttati-Pinetum sylvestris Anenkhonov et Ünal in Anenkhonov et Chytrý 1998

Diagnostic species: *Fragaria orientalis, Cypripedium guttatum, Ranunculus propinquus, Anemone sylvestris, Viola dactyloides, Thalictrum simplex.*

This association was described from the Barguzin river basin, the North-Eastern Baikal Region (ANENKHONOV et CHYTRÝ, 1998). These forests are found on well-drained soils of hillsides under a continental summer-warm climate. They are spread at the north-eastern limit of the *Rhytidio-Laricetea* range and are characterized by a weak role of the xerophytes and meso-xerophytes and poor floristic composition in comparison with southern communities of the class. The presence of some *Vaccinio-Piceetea* species is seen here.

Scorzonero radiatae-Pinetum sylvestris Anenkhonov et Ünal in Anenkhonov et Chytrý 1998

Diagnostic species: *Scorzonera radiata, Aster alpinus, Sanguisorba officinalis, Bromopsis inermis, Vicia amoena, Artemisia sericea.*

This association was described from the Bargusin river basin and like previous one was placed in the order *Carici pediformis-Laricetalia sibiricae* (the *Astero alpini-Laricetalia sibiricae* in original publication). In the present study, both these associations were transferred in the *Festuco-Laricetalia*. The main reason for the solution is few diagnostic species of the *Carici pediformis-Laricetalia sibiricae* and weak role of the xerophytes and meso-xerophytes. The latter species *Schizonepeta multifida, Stemmacantha uniflora, Youngia tenuifolia, Poa botrioides,*

In the present study, the association *Geranio-Laricetum* has been included into the *Rhytidio-Laricetea* in the smaller syntaxonomical volume. It is represented by three subassociations. Their detailed characteristics as variants have been made in HILBIG's papers (1990, 1996). Only diagnostic indications are presented here. The species indicating the moderately moist, moderately cold environments of sites were included in the diagnostic species group.

Two syntaxa described by HILBIG, 1990 as variants of the subassociatons *Geranio pseudosibiricae-Laricetum sibiricae aconitetosum barbati*, var. *Kobresia bellardi* (Table XI: *14*) and var. *Stellaria bungeana* (Table XI: *16*) have higher syntaxonomical ranks. They were described from the colder and more continental regions of the Central Khangai and Khubsugul. Perhaps, they could be placed at the association rank in the suballiance *Festuco altaicae-Laricenion sibiricae*. However, the additional data are required for the problem solution.

Geranio pseudosibiricae-Laricetum sibiricae aconitetosum barbati Hilbig 1990, 1996
(Table XI: *17, 18, 19*)

Diagnostic species are those of the association.

Variant typical (Table XI: *17*) includes typical community of the subassociation.

Variant *Crepis sibirica* (Table XI: *19*) includes more mesophilous forests.

Variant *Geranium eriostemon* (Table XI: *18*) includes communities of the former association *Vicio venosae-Laricetum sibiriace* I. Korotkov *et al.* in Ermakov *et al.* 1992 nom. nud. These are larch forests of the lower part of the forest-steppe belt of the South-Western Khentei. They are characterized by an increase of the role of Manchurian-Daurian species.

Geranio pseudosibiricae-Laricetum sibiricae cacalietosum hastatae Hilbig 1990 (1996)
(Table XI: *20*)

Diagnostic species: *Aconitum turczaninovii, Aconitum septentrionale, Senecio nemorensis, Cacalia hastata, Calamagrostis langsdorffii* incl. *C. purpurea, Artemisia frigida.*

These are forests of moderately cold, humid sites.

Geranio pseudosibiricae-Laricetum sibiricae calthetosum palustris Hilbig 1990 (1996)
(Table XI: *21*)

Diagnostic species: *Caltha palustris, Carex orbicularis, Hedysarum inundatum, Pedicularis oederi, Ranunculus monophyllus, Saxifraga hirculus, S. punctata.*

These are forests occurring in the sites with periodically excess moisture of soils.

Betulo platyphyllae-Populetum tremulae Hilbig 1990 (1996)
(Table XI: *22*)

Diagnostic species: *Populus tremula, Elymus mutabilis, Rubus saxatilis, Sedum aizoon.*

The association was described by HILBIG (1990) from North-Eastern Mongolia. We included it in the *Rhytidio-Laricetea* in the original syntaxonomic volume. This is the only association belonging to the order *Festuco-Laricetalia* with predominance of the small-leaved tree species, for which the Mongolian ultracontinental climate is unfavourable. *Betula pendula* and *Populus tremula* occur here at the southern limits of the ranges.

The communities of the *Betulo platyphyllae-Populetum tremulae* are characterized by poorer floristic composition in comparison with the physiognomicaly similar birch-aspen hemiboreal forests belonding to the class *Querco mongolicae-Betuletea davuricae* which occur in the more warm and humid adjacent regions of the West Dauria because of reduction of the role of thermophilous Manchurian-Daurian species.

Vicio unijugae-Laricetum sibiricae Ermakov, I. Korotkov et Laletin ex hoc loco
(Table XI: *23*)

Nom. type is relevé nr. 57, Table XIII.
Diagnostic species are moderately thermophilous xero-mesophytes: *Adenophora lamarckii, Astragalus membranaceus, Elymus dahuricus, Myosotis sylvatica, Vicia unijuga.*

These xero-mesophilous grass forests are widespread in the forest-steppe belt of the Khentei. They occupy western and eastern moderately dry convex slopes at altitudes of 1500-1700 m. The soils of their sites are seasonally frozen, but with shorter period of melting in comparison with those of the forest-steppe belt of the East Khangai.

Irido-Laricetum sibiricae Mirkin in Mirkin *et al.* 1988

The association was described (MIRKIN *et al.*, 1988) from the forest-steppe belt of the North-Eastern Khangai. In this paper, B. Mirkin for the first time supposed the existence of the special class of Siberian and Mongolian grass forests – the present class *Rhytidio-Laricetea sibiricae*.

These are poor in floristic composition communities (18-23 species per plot) of larch forests occurring in the northern and north-western slopes at altitudes of 1800-1910 m.

Cypripedio guttati-Pinetum sylvestris Anenkhonov et Ünal in Anenkhonov et Chytrý 1998

Diagnostic species: *Fragaria orientalis, Cypripedium guttatum, Ranunculus propinquus, Anemone sylvestris, Viola dactyloides, Thalictrum simplex.*

This association was described from the Barguzin river basin, the North-Eastern Baikal Region (ANENKHONOV et CHYTRÝ, 1998). These forests are found on well-drained soils of hillsides under a continental summer-warm climate. They are spread at the north-eastern limit of the *Rhytidio-Laricetea* range and are characterized by a weak role of the xerophytes and meso-xerophytes and poor floristic composition in comparison with southern communities of the class. The presence of some *Vaccinio-Piceetea* species is seen here.

Scorzonero radiatae-Pinetum sylvestris Anenkhonov et Ünal in Anenkhonov et Chytrý 1998

Diagnostic species: *Scorzonera radiata, Aster alpinus, Sanguisorba officinalis, Bromopsis inermis, Vicia amoena, Artemisia sericea.*

This association was described from the Bargusin river basin and like previous one was placed in the order *Carici pediformis-Laricetalia sibiricae* (the *Astero alpini-Laricetalia sibiricae* in original publication). In the present study, both these associations were transferred in the *Festuco-Laricetalia*. The main reason for the solution is few diagnostic species of the *Carici pediformis-Laricetalia sibiricae* and weak role of the xerophytes and meso-xerophytes. The latter species *Schizonepeta multifida, Stemmacantha uniflora, Youngia tenuifolia, Poa botrioides,*

In the present study, the association *Geranio-Laricetum* has been included into the *Rhytidio-Laricetea* in the smaller syntaxonomical volume. It is represented by three subassociations. Their detailed characteristics as variants have been made in HILBIG's papers (1990, 1996). Only diagnostic indications are presented here. The species indicating the moderately moist, moderately cold environments of sites were included in the diagnostic species group.

Two syntaxa described by HILBIG, 1990 as variants of the subassociatons *Geranio pseudosibiricae-Laricetum sibiricae aconitetosum barbati*, var. *Kobresia bellardi* (Table XI: *14*) and var. *Stellaria bungeana* (Table XI: *16*) have higher syntaxonomical ranks. They were described from the colder and more continental regions of the Central Khangai and Khubsugul. Perhaps, they could be placed at the association rank in the suballiance *Festuco altaicae-Laricenion sibiricae*. However, the additional data are required for the problem solution.

Geranio pseudosibiricae-Laricetum sibiricae aconitetosum barbati Hilbig 1990, 1996
(Table XI: *17, 18, 19*)

Diagnostic species are those of the association.

Variant typical (Table XI: *17*) includes typical community of the subassociation.

Variant *Crepis sibirica* (Table XI: *19*) includes more mesophilous forests.

Variant *Geranium eriostemon* (Table XI: *18*) includes communities of the former association *Vicio venosae-Laricetum sibiriace* I. Korotkov *et al.* in Ermakov *et al.* 1992 nom. nud. These are larch forests of the lower part of the forest-steppe belt of the South-Western Khentei. They are characterized by an increase of the role of Manchurian-Daurian species.

Geranio pseudosibiricae-Laricetum sibiricae cacalietosum hastatae Hilbig 1990 (1996)
(Table XI: *20*)

Diagnostic species: *Aconitum turczaninovii, Aconitum septentrionale, Senecio nemorensis, Cacalia hastata, Calamagrostis langsdorffii* incl. *C. purpurea, Artemisia frigida.*

These are forests of moderately cold, humid sites.

Geranio pseudosibiricae-Laricetum sibiricae calthetosum palustris Hilbig 1990 (1996)
(Table XI: *21*)

Diagnostic species: *Caltha palustris, Carex orbicularis, Hedysarum inundatum, Pedicularis oederi, Ranunculus monophyllus, Saxifraga hirculus, S. punctata.*

These are forests occurring in the sites with periodically excess moisture of soils.

Betulo platyphyllae-Populetum tremulae Hilbig 1990 (1996)
(Table XI: *22*)

Diagnostic species: *Populus tremula, Elymus mutabilis, Rubus saxatilis, Sedum aizoon.*

The association was described by HILBIG (1990) from North-Eastern Mongolia. We included it in the *Rhytidio-Laricetea* in the original syntaxonomic volume. This is the only association belonging to the order *Festuco-Laricetalia* with predominance of the small-leaved tree species, for which the Mongolian ultracontinental climate is unfavourable. *Betula pendula* and *Populus tremula* occur here at the southern limits of the ranges.

The communities of the *Betulo platyphyllae-Populetum tremulae* are characterized by poorer floristic composition in comparison with the physiognomicaly similar birch-aspen hemiboreal forests belonding to the class *Querco mongolicae-Betuletea davuricae* which occur in the more warm and humid adjacent regions of the West Dauria because of reduction of the role of thermophilous Manchurian-Daurian species.

Vicio unijugae-Laricetum sibiricae Ermakov, I. Korotkov et Laletin ex hoc loco
(Table XI: *23*)

Nom. type is relevé nr. 57, Table XIII.
Diagnostic species are moderately thermophilous xero-mesophytes: *Adenophora lamarckii, Astragalus membranaceus, Elymus dahuricus, Myosotis sylvatica, Vicia unijuga.*

These xero-mesophilous grass forests are widespread in the forest-steppe belt of the Khentei. They occupy western and eastern moderately dry convex slopes at altitudes of 1500-1700 m. The soils of their sites are seasonally frozen, but with shorter period of melting in comparison with those of the forest-steppe belt of the East Khangai.

Irido-Laricetum sibiricae Mirkin in Mirkin *et al.* 1988

The association was described (MIRKIN *et al.*, 1988) from the forest-steppe belt of the North-Eastern Khangai. In this paper, B. Mirkin for the first time supposed the existence of the special class of Siberian and Mongolian grass forests – the present class *Rhytidio-Laricetea sibiricae*.

These are poor in floristic composition communities (18-23 species per plot) of larch forests occurring in the northern and north-western slopes at altitudes of 1800-1910 m.

Cypripedio guttati-Pinetum sylvestris Anenkhonov et Ünal in Anenkhonov et Chytrý 1998

Diagnostic species: *Fragaria orientalis, Cypripedium guttatum, Ranunculus propinquus, Anemone sylvestris, Viola dactyloides, Thalictrum simplex.*

This association was described from the Barguzin river basin, the North-Eastern Baikal Region (ANENKHONOV et CHYTRÝ, 1998). These forests are found on well-drained soils of hillsides under a continental summer-warm climate. They are spread at the north-eastern limit of the *Rhytidio-Laricetea* range and are characterized by a weak role of the xerophytes and meso-xerophytes and poor floristic composition in comparison with southern communities of the class. The presence of some *Vaccinio-Piceetea* species is seen here.

Scorzonero radiatae-Pinetum sylvestris Anenkhonov et Ünal in Anenkhonov et Chytrý 1998

Diagnostic species: *Scorzonera radiata, Aster alpinus, Sanguisorba officinalis, Bromopsis inermis, Vicia amoena, Artemisia sericea.*

This association was described from the Bargusin river basin and like previous one was placed in the order *Carici pediformis-Laricetalia sibiricae* (the *Astero alpini-Laricetalia sibiricae* in original publication). In the present study, both these associations were transferred in the *Festuco-Laricetalia*. The main reason for the solution is few diagnostic species of the *Carici pediformis-Laricetalia sibiricae* and weak role of the xerophytes and meso-xerophytes. The latter species *Schizonepeta multifida, Stemmacantha uniflora, Youngia tenuifolia, Poa botrioides,*

Artemisia commutata have constansy of 10-30%.

Forests of the *Scorzonero radiatae-Pinetum sylvestris* occur on well-developed dry terraces of the Bargusin river valley.

CARICI PEDIFORMIS-LARICETALIA SIBIRICAE Ermakov in Ermakov *et al.* 1991
(syn. *Astero alpini-Laricetalia sibiricae* Ermakov et I. Korotkov 1992 (Ermakov 1995)
(Table XII)

Nomenclatural type is the alliance *Carici pediformis-Laricion sibiricae*.

These are xerophilous and meso-xerophilous larch (*Larix sibirica*) and pine (*Pinus sylvestris*) forests of mountain systems of South Siberia and Mongolia. They are spread in the continental and ultracontinental climates, in the extreme dry for forests sites and across their ranges are in contact with steppes. On southern macroslopes of the mountain ridges, small areas of these forests occupy the south-western, south-eastern dry slopes within the forest-steppe belt at altitudes of 600-1900 m. In the margins of arid and semiarid intermountain basins, they inhabit northern shaded slopes of the lower mountains and hills surrounded by dry steppes.

The main dominant of the *Carici pediformis-Laricetalia* forests is *Larix sibirica* forming open tree layer with cover of 25-60%. The xerophilous shrubs (*Cotoneaster melanocarpus, Spiraea trilobata, Juniperus sabina, Caragana pygmaea, Rosa acicularis*) are characteristic of undergrowth. The herb layer has cover of 40-70%, richness in species of 34-62 per 200 m^2. Xerophilous mosses (*Rhytidium rugosum, Abietinella abietina*) are the constant species of the order and dominate in the ground layer (with cover of 5-90%). In the sites with seasonally frozen soils, an increase of the role of the boreal trees (*Pinus sibirica, Picea obovata*) is seen. In the northern part of the *Carici pediformis-Laricetalia* range, the larch is replaced by pine (*Pinus sylvestris*) as a result of a decrease of climate continentality. The xerophilous pine forests occur only in the azonal sites: dry steep slopes of mountains and sandy sites in semiarid intermountain basins. The main peculiarity of the *Carici pediformis-Laricetalia sibiricae* is predominance of xerophytes which are usual plants in the steppes of the *Festuco-Brometea* and *Cleistogenetea squarrosae*. These plants are diagnostic species of the order: *Achnatherum sibiricum, Artemisia gmelinii, Cotoneaster melanocarpus, Dianthus versicolor, Kitagawia baicalensis, Koeleria cristata, Phlomoides tuberosa, Shizonepeta multifida, Veronica incana, Vicia nervata.*

The order consists of two alliances showing the geographical peculiarities of the xerophilous forests.

Carici pediformis-Laricion sibiricae Ermakov in Ermakov *et al.* 1991
(Table XII: *1-14*)

Nomenclatural type is the association *Carici pediformis-Laricetum.*
Diagnostic species are xerophytes and meso-xerophytes of South-Siberian and North Asian plant geographical groups: *Allium strictum, Anemone sylvestris, Caragana arborescens, Carex obtusata, Festuca pseudovina, Fragaria viridis, Iris ruthenica, Poa urssulensis, Phleum phleoides, Polygala comosa, Spiraea chamaedryfolia, Thalictrum petaloideum.*

These are xerophilous and meso-xerophilous larch (*Larix sibirica*) and pine (*Pinus sibirica*) forests of the western part of the order range. They are widespread in the forest-steppe belt of mountain ridges, arid intermountain basins and dry valleys of the large rivers in the Altai and Sayani.

Cotoneastero melanocarpi-Laricenion sibiricae Ermakov suball. nova hoc loco
(Table XII: *7-14*)

Nomenclatural type is the association *Anemono sylvestris-Laricetum.*
Diagnostic species of the suballiance are those of the alliance.

These dominantly larch forests are typical communities of the alliance. They occur on the slopes with the weakly stony dry black soils, in the inner continental regions of the Altai and Sayani mountain systems.

Anemono sylvestris-Laricetum sibiricae Ermakov 1995
(Table XII: *8*)

Diagnostic species: *Adenophora lamarckii, Artemisia glauca, A. macrantha, Caragana pygmaea, Carex amgunensis, Dianthus superbus, Helictotrichon schellianum, Lathyrus humilis.*

These xerophilous larch forests occur in the Turan-Uyuk semiarid intermountain basin (North Tuva) at altitudes of 1000-1200 m. They occupy steep shadowed slopes surrounded by steppes of the *Cleistogenetea squarrosae*, in separate lower mountains within the arid basin. The combination of steppe xerophytes and meso-xerophytes predominate in the association and indicates the typical ecological features of the order *Carici-Laricetalia.*

Colurio geoidis-Laricetum sibiricae Ermakov ass. nova hoc loco
(Table XII: *7*)

Nom. type is relevé nr. 5 Table 1 in ERMAKOV, 1996b.
Diagnostic species: *Artemisia santolinifolia, Coluria geoides, Dichodon cerastoides, Goodyera repens, Picea obovata, Spiraea media, Stellaria bungeana, Thesium repens, Tephroseris praticola.*

This community was described as special subassociation of the *Anemono sylvestris-Laricetum* (ERMAKOV, 1996b). In present study, it have been included in separate association.

The forests belonging to this association are spread in the ultracontinental climate, on steep shadowed slopes of southern macroslopes of large mountain ridges surrounding the arid Ubsu-Nurskaya intermountain basin (South Tuva). There, they occur at the upper limit of forest-steppe belt at altitudes of 1500-1700 m. Their sites are characterized by colder soils and more changeable moisture regime during growth period in comparison with sites of the previous association. As a result, a decrease of the role of moderately thermophilous xerophytes and an increase of the role of boreal species of the *Vaccinio-Piceetea* take place here.

Primulo cortusoidis-Laricetum sibiricae Ermakov ass. nova hoc loco
(Table XII: *9-13*)

Nom. type is relevé nr. 67, Table XIII.
The diagnostic species, thermophilous meso-xerophilous, are *Artemisia laciniata, A. latifolia, A. sericea, Aulacospermum anomalum, Elymus gmelinii, Tephroseris integrifolia, Viola dissecta* as well as mesophytes *Adonis sibirica, Agrimonia pilosa, Elytrigia repens, Geranium pratense, G. pseudosibiricum, Geum aleppicum, Plantago urvillei, Primula cortusoides, Saussurea controversa, Vicia cracca.*

These are meso-xerophilous larch forests occurring in the northern semiarid intermountain basins (Ust-Kanskaya, Minusinskaya) of the Altai and Sayani. The climate of the region is warmer and less continental than that of interior parts of these mountain systems. The communities belonging to this

associations occupy northern, north-eastern and north-western slopes with moderately warm dry loamy black soils of the lower mountains, surrounding the intermountain basins at altitudes of 600-900 m.

Primulo cortusoidis-Laricetum sibiricae elytrigietosum gmelinii Ermakov subass. nova hoc loco
(Table XII: *9-10*)

Nom. type is relevé nr. 66, Table XIII.
Diagnostic species: *Adenophora liliifolia, Bistorta major, Carex humilis, Carum buriaticum, Delphinium laxilorum, Elytrigia gmelinii, Polygonatum odoratum, Potentilla chrysantha, Valeriana alternifolia.*

This is geographical type of the association which occurs in the Altai (Ust-Kanskaya basin).

Variant *Adoxa moschatellina* (Table XII: *9*) includes community occurring in the stony sites.

Variant *Atragene sibirica* (Table XII: *10*) includes community occurring in the sites with well-developed soils.

Primulo cortusoidis-Laricetum sibiricae filipenduletosum stepposae Ermakov subass. nova hoc loco
(Table XII: *11*)

Nom. type is relevé nr. 69, Table XIII.
Diagnostic species: *Adenophora coronopifolia, Agrostis vinealis, Artemisia vulgaris, Crepis praemorsa, Filipendula stepposa, Galatella macrosciadia, Helictotrichon pubescens, Hemerocallis minor, Myosotis imitata, Onobrychis tanaitica, Poa pratensis, Polygonatum humile, Potentilla flagellaris, Ranunculus polyanthemos, Tragopogon orientalis, Trommsdorfia maculata, Veronica krylovii.*

These are larch forests occurring on gentle slopes with well-developed black soils of lower mountains in the Minusinskaya basin.

Primulo cortusoidis-Laricetum sibiricae betuletosum pendulae Ermakov subass. nova hoc loco
(Table XII: *12*)

Nom. type is relevé nr. 70, Table XIII.
Diagnostic species: *Betula pendula, Poa transbaicalica.*

These are meso-xerophilous birch-larch forests of foot-hills of the eastern part of the Kuznetskiy Alatau ridge. They occur in the transitional strip between forest and forest-steppe belts.

Primulo cortusoidis-Laricetum sibiricae festucetosum sibiricae Ermakov subass. nova hoc loco (Table XII: *13*)

Nom. type is relevé nr. 68, Table XIII.
Diagnostic species: *Campanula sibirica, Elytrigia geniculata, Eritrichium pectinatum, Festuca sibirica, Galatella angustissima, Oxytropis strobilacea, Peucedanum vaginatum, Potentilla nudicaulis.*

These are the most xerophilous forests of the association. They occur on steep shadowed slopes surrounded by dry steppes.

Cotoneastero uniflori-Laricetum sibiricae Ermakov subass. nova hoc loco
(Table XII: *14*)

Nom. type is relevé nr. 71, Table XIII.
Diagnostic species: *Astragalus multicaulis, Astragalus suffruticosus, Campanula rotundifolia, Cotoneaster uniflorus, Gentiana decumbens, Gypsophila altissima, Lonicera microphylla, Moehringia lateriflora, Myosotis asiatica, Oxytropis ambigua, Pedicularis achilleifolia, P. elata, Potentilla conferta, P. gelida, Rosa pimpinellifolia, Veronica porphyriana.*

These xerophilous larch forests were described in the cold arid Kuraiskaya intermountain basin (the South-Eastern Altai) at altitudes of 1550-1600 m. They occur on northern steep slopes of separate mountains within this basin. The participation of cryophilous xerophytes and meso-xerophytes (*Cotoneaster uniflorus, Myosotis asiatica, Potentilla gelida, Oxytropis ambigua*) is the peculiarity of the association. They together with typical meso-xerophytes and xerophytes are in the group of diagnostic species of the association.

Sedo hybridi-Pinenion sylvestris Ermakov suball. nova hoc loco
(Table XIII: *1-6*)

Nomenclatural type is the association *Carici pediformis-Laricetum sibiricae.*
Diagnostic species are obligate and facultative petrophytes *Aconitum anthoroideum, Androsace septentrionalis, Dracocephalum ruyschiana, Euphorbia alpina, Hieracium umbellatum, Orostachys spinosa, Rhododendron dauricum, Sedum hybridum, Woodsia ilvensis.*

These are petrophilous pine (*Pinus sylvestris*) forest occurring in the northern part of the Altai and Sayani. They occupy southern steep slopes with poorly developed stony soils of lower mountains at altitudes of 600-900 m.

Carici pediformis-Laricetum sibiricae Ermakov in Ermakov *et al.* 1991
(Table XIII: *3-6*)

Diagnostic species are moderately thermophilous obligate and facultative petrophytes: *Allium nutans, Centaurea sibirica, Dracocephalum nutans, Galium paniculatum, Helictotrichon altaicum, Hypericum elegans, Inula salicina, Polygonatum odoratum, Potentilla longifolia, Spiraea trilobata, Thymus serpyllum.*

These are meso-xerophilous pine grass forests occurring in the forest-steppe belt of the warm semi-humid climate sector of the North Altai. They occupy gentle and steep southern slopes with poorly developed soils on chloride slates and limestones at altitudes of 500-800 m.

Carici pediformis-Laricetum sibiricae juniperetosum sabinae Ermakov subass. nova hoc loco
(Table XII: *3*)

Nom. type is relevé nr. 67, Table XIII.
Diagnostic species: *Hedysarum gmelinii, Veronica porphyriana, Juniperus sabina, Spiraea hypericifolia, Astragalus adsurgens, Artemisia dracunculus, Stipa pennata, Hieracium virosum, Erigeron krylovii, Stipa capillata, Potentilla bifurca, Linaria acutiloba.*

The most petrophilous forests of rocky sites on chloride slate bedrocks.

Carici pediformis-Laricetum sibiricae typicum Ermakov subass. nova hoc loco
(Table XII: *4*)

Nom. type is relevé nr. 44, Table 19 in ERMAKOV *et al.*, 1991.
Diagnostic species: *Origanum vulgare, Peucedanum morisonii, Filipendula vulgaris, Veronica spicata, Viola hirta.*

These are typical communities of the association occurring on dry gentle slopes with shallow black soils of lower mountains.

Carici pediformis-Laricetum sibiricae youngietosum tenuifoliae Ermakov subass. nova hoc loco
(Table XII: *5*)

Nom. type is relevé nr. 62, Table XIII.
Diagnostic species: *Allium clathratum, Alyssum obovatum, Campanula altaica, Dendranthema sinuatum, Echinops ruthenicus, Potentilla acaulis, Saussurea salicifolia, Youngia tenuifolia, Ziziphora clinopodioides.*

These are the most xerophilous communities of the association, occur-

ring in the continental climate of the Central Altai, in the sites with rock exposure and black soils on limestones.

Carici pediformis-Laricetum sibiricae neottianthetosum cucullatae Ermakov subass. nova hoc loco
(Table XII: *6*)

Nom. type is relevé nr. 63, Table XIII. Diagnostic species: *Neottianthe cucullata, Potentilla flagellaris, Seseli libanotis.*

The subassociation was described in the higher dry gravel-covered terraces of the Katun river (the Central Altai). They occupy shadowed slopes of the deep depressions and gulches in the terraces.

Patrinio sibiricae-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table XII: *2*)

Nom. type is relevé nr. 65, Table XIII. Diagnostic species: *Antennaria dioica, Artemisia santolinifolia, Cerastium arvense, Eritrichium pectinatum, Lychnis sibirica, Oxytropis campanulata, Patrinia sibirica, Pedicularis sibirica, Potentilla sericea, Rubus saxatilis, Tephroseris porphyrantha, Trommsdorfia maculata, Vicia unijuga.*

These are meso-xerophilous pine-larch forests of the lower mountains in the northern part of the West Sayani. They occur on warm dry southern slopes with poorly developed soils on the chloride slates, at altitudes of 700-900 m. The temperate thermophilous meso-xerophytes and mesophytes predominate in the forests. The communities belonging to this association are replaced by mesophilous pine-birch forests of the *Filipendulo vulgaris-Pinetum* (the class *Brachypodio-Betuletea*) in the sites with more mesic well-developed soils.

Kitagawio baicalensis-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table XIII: *1*)

Nom. type is relevé nr. 64, Table XIII. Diagnostic species: *Calamagrostis pavlovii, Campanula rotundifolia, Gypsophila sericea, Vaccinium vitis-idaea.*

These petrophilous meso-xerophilous pine forests with participation of larch (*Larix sibirica*) occur in the narrow mountain river valleys of the central part of the West Sayani, at altitudes of 800-1100 m. Small areas of these forests together with steppes form combination on moderately warm steep stony slopes, in the continental climate.

In this environments, the participation of moderately thermophilous meso-xerophytes widespread in the pine forests of lower mountains of the northern part of the West Sayani decreases. Besides, the role of more cryophilous species which are typical of hemiboreal forests of ultracontinental regions of Southern Tuva and Mongolia increases. The letter together with obligate and facultative petrophytes (*Gypsophylla sericea, Campanula rotundifolia*) form the group of diagnostic species of the association.

Pulsatillo turczaninowii-Pinion sylvestris Ermakov all. nova hoc loco
(syn. *Pulsatillo turczaninowii-Laricion gmelinii* Ermakov et I. Korotkov 1992 nom. nud.) (Table XII: *15-17*)

Nomenclatural type is the association *Lespedezo junceae-Pinetum sylvestris.* Diagnostic species: *Allium splendens, Bupleurum scorzonerifolium, Dendranthema zawadskii, Filifolium sibiricum, Leontopodium conglobatum, Orostachys malachophylla, Oxytropis myriophylla, Patrinia rupestris, Potentilla tanacetifolia, Pulsatilla turczaninovii, Scabiosa comosa, Sedum aizoon, Stellera chamaejasme, Stemmacantha uniflora.*

These are xerophilous psammophilous pine (*Pinus sylvestris*) (sometimes with participation *Larix gmelinii*) forests of the eastern part of the *Carici pediformis-Laricetalia* range. They occupy the moderately warm sites with the dry oligotrophic sandy soils on the higher terraces of wide river valleys, lower southern mountain slopes and sandy sites of the semiarid intermountain basins of the West Dauria and North-Eastern Mongolia (the Selenga and Onon river basins). These xeric sandy sites are favorable for growth of pine avoiding the habitats with cold loamy soils which predominate on mountain slopes. The characteristic feature of the alliance communities is important role of moderately thermophilous species of Manchurian-Daurian plant geographical group which grow at the westernmost limits of their ranges.

Lespedezo junceae-Pinetum sylvestris Ermakov ass. nova hoc loco
(Table XII: *15-16*)

Nom. type is relevé nr. 72, Table XIII. Diagnostic species: *Artemisia commutata, A. frigida, Carex argunensis, Leibnitzia anandria, Lespedeza juncea, Viola gmeliniana, Youngia tenuifolia.*

These are xerophilous psammophilous pine grass forests of the West Dauria occurring on dry oligotrophic slopes of the lower mountains at altitudes of 800-1000 m. The floristic composition of the forests is characterized by the higher role of Manchurian-Daurian xerophytes, which were included in the group of diagnostic species.

Lespedezo junceae-Pinetum sylvestris typicum Ermakov subass. nova hoc loco
(Table XII: *15*)

Nom. type is relevé nr. 72, Table XIII. Diagnostic species: *Allium tenuissimum, Chamaerhodos erecta, Cleistogenes squarrosa, Heteropappus altaicus, Iris tigridia, Koeleria glauca, Lilium pumilum, Polygala sibirica, Potentilla acaulis, Ribes diacantha, Saposhnikovia divaricata, Stipa baicalensis, Vicia amoena.*

The most xerophilous pine forests of sandy sites of the steppe belt of the Selenga river basin.

Lespedezo junceae-Pinetum sylvestris silenetosum jenisseensis Ermakov subass. nova hoc loco (Table XII: *16*)

Nom. type is relevé nr. 73, Table XIII. Diagnostic species: *Aconogonon angustifolium, Astragalus membranaceus, Ixeridium chinense, Saussurea elongata, Silene jeniseensis.*

The xerophilous psammophilous pine forests of the forest-steppe belt of the West Dauria.

Pulsatillo turczaninovii-Pinetum sylvestris Ermakov ass. nova hoc loco
(syn. *Pulsatillo turczaninovii-Laricetum gmelinii* Ermakov et I. Korotkov 1992 nom. nud.) (Table XII: *17*)

Nom. type is relevé nr. 74, Table XIII. Diagnostic species are Daurian and Manchurian-Daurian mesophytes and xero-mesophytes: *Artemisia sericea, Astragalus mongolicus, Betula platyphylla, Bistorta alopecuroides, Carex lanceolata, Festuca ovina, Iris uniflora, Larix gmelinii, Lathyrus humilis, Lespedeza davurica, Silene sibirica, Spiraea flexuosa, Tragopogon orientalis, Vicia cracca.*

These are meso-xerophilous psammophilous pine (with participation *Larix gmelinii*) grass forests of the north-western part of Mongolia. They occur in the sandy sites (more mesic than those of the previous association) of the higher terraces of the Onon river basin at altitudes of 900-1100 m.

Syntaxonomical notes

ANENKHONOV and CHYTRÝ (1998) described the alliance *Hieracio umbellati-Pinion sylvestris* Anenkhonov et Chytrý 1998 from the East Baikal Region and included it in the class *Rhytidio-Laricetea*, order *Carici pediformis-Laricetalia* (the *Irido-Laricetea, Astero alpini-Laricetalia sibiricae* in the original publication). In the present study, this alliance has not been included in the class *Rhytidio-Laricetea* because of closeness of the majority of the associations: *Vicio nervatae-Pinetum sylvestris* Anenkhonov et Chytrý 1998 (the nomenclature type of the alliance), *Spiraeo mediae-Pinetum sylvestris, Calamagrostio epigei-Pinetum sylvestris*, and community *Pinus pumila-Populus tremula* to the dry continental taiga forests of the class *Vaccinio-Piceetea*. These moderately cryophilous communities are characterised by predominance of characteristic species of the *Vaccinio-Piceetea* over diagnostic species of other higher syntaxa. The regional Siberian and widespread species of the *Vaccinio-Piceetea* (*Pinus sibirica, Duschekia fruticosa, Linnaea borealis, Pyrola incarnata, Antennaria dioica, Vaccinium vitis-idaea, Empetrum sibiricum, Rubus arcticus, Pleurozium schreberi, Cladonia rangiferina, C. arbuscula, C. stellaris*) are of important role there. Besides, the diagnostic species of the *Rhytidio-Laricetea* (and other meso-xerophytes) are few in number and indicate only some insufficient moisture of sites of the forests. These environments are typical for moderately xerophilous boreal forests of the alliance *Dicrano-Pinion*. Similar coniferous forests of this alliance with participation of boreal mesophytes and some xero-mesophytes as well as with presence of oligotrophic, moderately mesophilous species, *Carex ericetorum, Arctostaphylos uva-ursi, Pyrola chloranta* (character species of the *Dicrano-Pinion*) are common accross South Siberia. Probably, the *Hieracio umbellati-Pinion sylvestris* is synonymous of the *Dicrano-Pinion* or it is a special Siberian vicarious alliance belonging to the Eurasian class *Vaccinio-Piceetea*. The further detailed syntaxonomical and plant-geographical study is required for elucidation of this problem.

Two other associations: *Cypripedio guttati-Pinetum sylvestris* and *Scorzonero radiatae-Pinetum sylvestris* of the *Hieracio umbellati-Pinion sylvestris* have been transferred to the *Rhytidio-Laricetea, Festuco-Laricetalia* in the present study. In these communities, the diagnostic species of the *Rhytidio-Laricetea* and subordinated syntaxa predominate over those of other higher units.

DISCUSSION

In the present study, the communities of transcontinental zonal geographical type of vegetation – continental hemiboreal forests have been included in different higher units of the floristic classification. The floristic distinctions among these higher units are closely related with the genesis of the hemiboreal forest types in different floristic provinces of Asia and in different palaeo-climatic periods. The current phytosociological types of hemiboreal forests are characterized by peculiar floristic compositions and special plant-geographical relations with various types of zonal vegetation of Eurasia. The discussion of some problems of hemiboreal forests genesis is an important aspect for formation of the concept of their classification.

Understanding of the genesis of xero-mesophilous and xerophilous hemiboreal forests of the classes *Brachypodio-Betuletea, Rhytidio-Laricetea, Querco mongolicae-Betuletea davuricae* in South Siberia and adjacent mountain systems of North Mongolia is closely related with idea of formation of the forest-steppe zone in the territory of Eurasia.

According to the data of palaeobotanists (BOYARSKAYA, MALAYEVA, 1967; VOLKOVA, 1977; SAVINA *et al.*, 1981; BELOVA, 1985; NIKITIN, 1989; MARTYANOV, 1989) the formation of landscapes similar to current forest-steppe in South Siberia and North Mongolia started since the middle Miocene owing to an increase of aridity and continentality of climate in the center of Eurasia. As a result, in the late Miocene the zonal thermophilous mesophilous broad-leaved and coniferous-broad-leaved forests of the Turgai type were replaced by semi-arid ecosystems of savanna (pre-forest-steppe) type. Further formation of the pre-forest-steppe ecosystems was conditioned by gradual increase of the cold during the Pliocene. Palaeobotanists mentioned as well as plant-geographists (KRASHENINNIKOV, 1937; KLEOPOV, 1991; POPOV, 1949; PESHKOVA, 1972; MALYSHEV, PESHKOVA, 1984; KAMELIN, 1998) consider the moderately thermophilous forest-steppe with participation of broad-leaved (*Quercus, Ulmus, Tilia*), small-leaved (*Betula, Populus*), coniferous (*Pinus, Larix*) and mixed forests to be widespread in South Siberia and North Mongolia in the Late Pliocene. The most important factor of development of the forest-steppe after the middle Pliocene was the latest epeirogenesis of the Altai, Sayani, Khangai mountain systems, which promoted an increase of climate continentality in the center of Eurasia as well as of the further sector and altitude-zonal differentiation of the vegetation. In the late Pliocene, two geographical sectors of the forest-steppe zone – amphi-Atlantic and amphi-Pacific existed on the continent. The broad-leaved (with participation of small-leaved and coniferous trees) forests, which bore some important phytosociological and ecological features similar to current temperate mixed forests of the forest-steppe zone of Eastern Europe and Manchuria were widespread in these geographical sectors.

In the next Quaternary period, the late-Pliocene forest-steppe was globally transformed in the territory of South Siberia and North Mongolia because of essential growing cold and the periodical glaciations. The genesis of the Pleistocene forest-steppe was accompanied by catastrophic transformation of the Tertiary nemoral vegetation over the course of the last million of years, as cold and arid climate of glacial and some interglacial periods was to a large extent unfavorable for the Pliocene mesophilous thermophilous species. During the Pleistocene, further sector differentiation of the transcontinental forest-steppe zone was taking place as a consequence of an increase of climate continentality (decrease of influence of the World oceans) and growing cold. As a result, new Pleistocene zonal light coniferous (*Larix sibirica, Pinus sylvestris*) and small-leaved (*Betula pendula, B. platyphylla*) hemiboreal forests were formed as communities of the cold forest-steppe on the basis of light-demanding more cryophilous and xerophilous flora.

In the current climate, there are, at least, four vicarious phytosociological and geographical types of hemiboreal forests in the composition of the forest-steppe zone of the continental and ultracontinental sectors of Eurasia, whose genesis is closely related with the palaeogeography of the Pleistocene.

Current temperate-continental West Siberian hemiboreal forests of the class *Brachypodio-Betuletea* bear some important ecological and plant

geographical features of the forests of the western amphi-Atlantic sector of ancient cold forest-steppe existed in the Pleistocene. This territory was always exposed to the Atlantic ocean influence. This influence could be greater or less in different palaeo-geographical periods, but it always determined temperate climate continentality of the western sector of forest-steppe as compared with the higher continentality of the central (Mongolian) and eastern (amphi-Pacific) sectors. The *Brachypodio-Betuletea* forests show strong plant geographical relations with European temperate and cool-temperate vegetation. Their allochtonous flora dominantly consists of the light-demanding, moderately thermophilous species of European-Siberian, North Asian, West-Palaearctic and Eurasian plant geographical groups, which occur in Europe in the communities of ecologically different classes: *Molinio-Arrhenatheretea*, *Querco-Fagetea, Festuco-Brometea*, *Mulgedio-Aconitetea* and *Trifolio-Geranietea*. The relatively heterogenous composition of phytosociological and ecological species groups is a result of the genesis of these forests in the moderately continental climate. Besides, some moderately thermophilous, mesophilous nemoral species are still important in the post-Pleistocene West Siberian hemiboreal forests. Phytocoenotic analogues of present West Siberian *Brachypodio-Betuletea* forests could be widespread in Central and Eastern Europe in the composition of forest-steppe during dry and cold Pleistocene periods.

Including of the *Pulsatillo-Pinetea* communities in the group of amphi-Atlantic forests is confirmed by distribution of the class across the western part of the transcontinental steppe zone from Central Europe to the south-eastern part of the West Siberian Plain, which is influenced by the Atlantic Ocean. Nevertheless, unlike the forests of the *Brachypodio-Betuletea*, the *Pulsatillo-Pinetea* communities were formed as azonal type of vegetation in arid and semi-arid climate of steppe zone. The genesis of Siberian *Pulsatillo-Pinetea* forests is closely related with formation of the fluvio-glacial sandy deposits in the steppe zone during the post-Pleistocene. Their allohtonous flora was dominantly formed from East European-Siberian steppe xerophytes and psammophytes of surrounded zonal steppes of the *Festuco-Brometea* and psammophilous steppes of the *Koelerio-Corynephoretea*.

The amphi-Pacific Manchurian-Daurian forests of the class *Querco mongolicae-Betuletea davuricae* were formed as a component of the eastern sector of cold Pleistocene forest-steppe on the base of moderately thermophilous Tertiary Eastern-Asian flora and differ essentially from amphi-Atlantic forests not only in species composition but in genus one. The genesis of the forests was closely related with the monsoon climate of Dauria and West Manchuria. The main peculiarity of the climate type lies in the fact that the Pacific Ocean influences the climate of the continent mostly in the summer period. The climate of the *Querco-Betuletea davuricae* class range in winter is characterized by small amounts of precipitation and low temperatures due to the weak influence of the Pacific Ocean and domination of the Siberian anticyclone.

The core of flora of the *Querco-Betuletea* class is represented by light-demanding xero-mesophytes of the Daurian-Manchurian plant geographical group. The majority of them are not true forest plants as they grow in both open forests and meadows (*Calamagrostietea langsdorffii*), steppes and shrub communities (*Cleistogenetea squarrosae*). These plants, like the European-Siberian species of amphi-Atlantic hemiboreal forests are thermophilous ones in relation to the temperature regime of summer period. However, they possess completely different adaptations to the most important limiting factors of moisture regime and temperatures in cold season.

There is only a small number of species belonging to a larger South-Siberian-Manchurian-Daurian chorological group. They are disjunctively distributed in the forest-steppe zone of South Siberia and represent here a relict Eastern-Asian moderately thermophilous element.

The essential floristic distinctions between amphi-Atlantic and amphi-Pacific forests are shown in the composition of ecological and phytosociological groups. The true mesophytes of subalpine-forest and nemoral groups, which can grow during moderately warm and moist winters are absent in the *Querco-Betuletea davuricae* communities. VERKHOLAT and KRYLOV (1982) linked the origin of current xero-mesophilous oak and birch-oak forests belonging to the class *Querco-Betuletea davuricae* with a Tertiary Eastern Asian mountain prairie-forest-steppe which developed autochthonously under the continental climate in East Asia. An original way of genesis of the continental xero-mesophilous oak forests of the Amur river basin different from that of suboceanic mesophilous broad-leaved formations rich in tree species is pointed to by KURENTSOVA (1973).

The cryo-xerophilous larch forests of the class *Rhytidio-Laricetea* occur in the composition of the most cryophyte variant of mountain forest-steppe of arid ultracontinental climate of South Siberia and North Mongolia. Their sites (first of all unique type of seasonally frozen soils) are characterized by large variations of temperature and moisture regimes during growth period. It determines growing of xerophytes, meso-xerophytes, mesophytes, moderate cryophytes and cryophytes simultaneously in the same communities.

The results of analysis performed of floristic peculiarities of the cryo-xerophilous forests (ERMAKOV, 1999a) revealed absolutely allochtonous type of their flora, i.e., absence of characteristic species (or species growing chiefly in these forests). The main role in the *Rhytidio-Laricetea* forests is played by the species of surrounding vegetation types - steppes and mountain tundra, as well as by some widespread south-boreal and meadow plants. That is why the chorological spectrum of the *Rhytidio-Laricetea* reflects various plant-geographical relations of steppe, high-mountain and forest vegetation. These peculiarities of the flora of the *Rhytidio-Laricetea* result in the assumption that they are of historically young age and have the most distinct relict features of the vegetation of dry and cold Pleistocene periods compared with other present geographical types of hemiboreal forests. Combination of moderately cryophilous south-boreal mesophytes and steppe xerophytes is also observed in current forests of the forest-steppe zone of warmer mountain regions in East Europe, South Ural, South Siberia and Dauria. However, true cryophilous mountain-tundra and alpine-meadow species occur rarely there, being the relics of the colder vegetation of the Pleistocene.

An analysis of spore-pollen spectra composition performed by SAVINA *et al.* (1981) in seasonally frozen soils of current cryo-xerophilous larch forests of Mongolian Altai and Central Khangai made it possible for the authors to assume that the soils had been formed in the late Pleistocene – the early Holocene. The pollen combinations of alpine, meadow, forest and steppe species together with abundant pollen of larch occur throughout the seasonally frozen soil profiles and point to the existence of cryo-xerophilous larch

forests as a peculiar plant-geographical type over the course of the Holocene to the present. The predominance of Eastern Asian relations is seen in the flora of cryo-xerophilous larch forests. These relations are mainly provided by south-boreal and meadow-steppe species, which are usual plants of the present amphi-Pacific xero-mesophilous forests of the class *Querco mongolicae-Betuletea davuricae* of the Manchurian-Daurian forest-steppe. They are of greater phytocoenotic importance in the cryo-xerophilous forests than European-Siberian and West-Palaearctic species. The role of species of South-Siberian-Mongolian-Daurian and Eastern Asian plant geographical groups increases in the *Rhytidio-Laricetea* forests eastwards from the Mongolian Altai to Khentei, as the influence of the Pacific ocean's monsoon gets stronger. The flora of cryo-xerophilous larch forests is historically substantially related with the Pliocene Eastern-Asian temperate thermophilous forest-steppe with participation of meso-xerophilous oak (*Quercus mongolica*) and birch (*Betula davurica*) forests than with the Pliocene European-Siberian one. These late Pliocene xero-mesophilous oak-birch forests degraded completely in the territory of the mountain systems of the Sayani and Khangai due to climate changes in the Pleistocene. A new type of monodominant larch forests was formed as a component of cold mountain forest-steppe on the basis of different Pleistocene phytosociological groups of species: meadow-steppe, mountain steppe, mountain tundra and south boreal. The mountain systems of North Mongolia and South Siberia were an important center of formation of the cold forest-steppe. This is supported by a wide range of endemic South-Siberian-Mongolian species in all leading phytosociological groups.

The small-leaved-coniferous hemiboreal (subnemoral) mixed forests of the *Querco-Fagetea* (*Fagetalia sylvaticae*) represent the most thermophilous relict type of the primary Siberian vegetation which is not related by origin with the forest-steppe vegetation of North Asia. The plant geographical and coenogenetic unity of the Siberian mesophilous subnemoral forests and European temperate forests of the class *Querco-Fagetea*, even without common geographical boundary, is indicated by numerous characteristic species of the class *Querco-Fagetea* which have European-Siberian disjunctive ranges and are relic plants in South Siberia.

The Siberian *Fagetalia* forests are the main component of the unique mountain landscapes closely connected by origin with local orographycal and meso-climatic conditions of the foothills of the Altai and West Sayani which are conditioned by final influences of the Atlantic ocean on the climate of inner regions of the continent. The meso-climate of these marginal mountain regions is characterized by the highest warmth and precipitation indices in Siberia. In accordance with palaeogeographical data, original meso-climate of the western part of the Altai was formed at the end of the Tertiary period, the time of the intensive formation of this mountain system. Palaeobotanical data testify to thermophilous vegetation - broad-leaved and coniferous-broad-leaved mixed forests - in the territory of the Altai at that time (KORNILOVA, 1966; VOLKOVA, PANOVA, 1975). Subsequently, over the course of all glacial Pleistocene periods, despite the general cold climate, this area remained the warmest and humidest in Siberia and was a refuge for preservation of thermophilous vegetation and flora.

The important peculiarity of the Siberian *Fagetalia* communities is a significant role of subalpine-forest tall-forb species. Excess humidity, good heat provision and soil fertility cause great competition between the tree layer and tall-forbs. The relationships of these two components result in the combination of dense forest sites, open forests, and tall-forb meadows within the subbelt. Similar relationships of forests and tall-forb communities are characteristic of the subalpine belt of many mountain systems. However, in this case we are dealing not with timber line, but with a lower part of the forest belt. The geographical analogues of the Siberian *Fagetalia* forests are communities of the alliance *Fagion* Luquet 1926 in the Central Alps (ELLENBERG, 1986; OBERDORFER, 1992). The common features are the most evident for the associations that are spread in the upper part of the forest belt at the boundary with the subalpine one:

- the tree layer is characterized by poor presence of the broad-leaved species and strong position of coniferous ones (*Abies alba* and *Picea abies*);
- the group of the characteristic *Querco-Fagetea* species is strongly reduced, and the *Fagetalia* species play the main diagnostic role;
- in all associations, the number of southern boreal species is significant;
- the subalpine *Adenostyletalia* Br.-Bl. 1930 species are of great differentiating importance for some syntaxa.

The group of Siberian subalpine-forest plants - *Aconitum septentrionale, Cirsium heterophyllum, Bupleurum longifolium* and group of widespread south-boreal species indicate strong plant-geographical relations of the Siberian subnemoral forests with the communities of the alliances *Fagion* and *Alno-Ulmion* from South Norway (KIELLAND-LUND, 1981). The phytosociological role of the subalpine-forest species increases in broad-leaved forests in the direction from North Europe to the Urals. The Altai-Sayanian subnemoral forests are the most similar to the Ural communities of the alliances *Aconito septentrionalis-Tilion cordatae* Solomeshch in Solomeshch *et al.* 1993 and *Aconito septentrionalis-Picenion* Solomeshch 1993 and form a united easternmost part of the *Fagetalia* range in Eurasia.

The presence of the subalpine *Mulgedio-Aconitetea* species in the mountain *Fagion* communities in the Alps is a critical fact for understanding of the genesis of Siberian subnemoral forests. In a similar manner, we observe the significant phytosociological role of the subalpine species of this class in the Ural coniferous-broad-leaved and Siberian subnemoral forests. KLEOPOV (1941, 1990) and ERMAKOV (1998) used this fact to connect current mountain subnemoral forests of South Siberia and the Urals by common origin from the Pliocene coniferous-broadleaved forests. The latter were formed in the late Tretiary period at the upper boundary of the forest belt, in the contact with the subalpine tall-forb meadows in the Altai-Sayanian mountain system. In current climate of Siberia, the fragments of the subbelt of thermophilous *Fagetalia* forests and tall-forb meadows have been only preserved in warm ultrahumid foot-hills of the Altai and Sayani and represent relict landscapes. The analogues of such landscapes with combination of the *Fagetalia* and *Mulgedio-Aconitetea* communities occur in the mountain systems of Europe. Preservation of the relic *Fagetalia* forests in South Siberia is strictly connected with local mountain meso-climate which appeared at the end of the Tretiary period as a result of interaction of two factors - amphi-atlantic climatic regime and special location of the ridges of the Altai and Sayani.

Table III — Suballiance *Cruciato krylovii-Pinenion sylvestris*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Mean altitude (m)		660	650	1280	750	1150	680	375	850	1450	640	511	700	590	690	1170	1030	1180	900	830
Mean cover of tree layer %		59	54	49	62	49	58	63	50	54	60	59	62	63	60	66	58	57	52	60
Mean cover of shrub layer (%)		23	17	25	4	19	21	34	60	3	5	6	5	6	11	11	27	5	5	13
Mean cover of herb layer (%)		79	84	68	77	66	73	68	45	71	81	74	75	73	74	70	67	57	68	57
Mean cover of moss layer (%)		7	5	7	3	58	8	10	3	2	3	3	3	3	4	3	2	3	10	4
Mean heigt of tree layer (m)		23	23	24	22	19	23	22	20	21	23	22	22	22	21	21	19	20	19	20
Mean heigh of shrub layer (cm)		180	140	74	76	160	63	67	46	40	61	43	52	57	50	54	68	42	53	66
Mean height of herb layer (cm)		92	85	63	78	34	42	38	42	39	48	41	53	46	45	42	36	32	38	34
Mean nr. of species in one relevé		71	73	62	61	51	55	48	50	60	67	80	76	69	66	47	46	46	55	51
Relevé area		Everywhere 200 m^2																		
Number of species		163	144	171	181	87	188	89	174	104	130	160	159	153	186	82	88	82	99	98
Number of relevés		8	7	36	38	4	20	6	15	5	7	9	11	15	25	11	6	7	6	12
The main species of tree layer																				
Pinus sylvestris	-t1	V^4	II^3	.	III^4	V^4	V^4	V^4	V^4	.	V^4	V^4	.	.	.	.	.	.	.	V^3
Betula pendula	-t1	V	V^3	+	V^3	III	V^2	V^2	III^2	.	V^3	V^2	V^4	V^4	V^4	V^2	V^2	V^2	II	V^2
Larix sibirica	-t1	II	III^3	V^4	IV^2	IV	+	.	+	V^4	I	.	V^3	III^3	V^3	V^4	V^4	V^4	V^4	V^3
D.S. Ass. ***Anemonoido caeruleae-Pinetum sylvestris***																				
Ranunculus monophyllus	-hl	V	V	V	IV	.	+	.	.	.	.	.	I	I	II	.	.	.	.	.
Lathyrus gmelinii	-hl	V^2	IV	II	V	IV	II	II	.	I	IV	I	.	I	+	.	.	.	.	.
Cacalia hastata	-hl	IV	V	IV	III^2	.	+	.	.	.	III	.	II	I	II	I	.	.	II	II
Bistorta major	-hl	IV	IV	IV	IV	IV	II	.	II	.	I	.	.	.	+	.	I	.	.	.
Aegopodium alpestre	-hl	V	V^2	V	V^2	V	II	.	.	I	I	.	.	+	II	.	I	.	.	I
Polemonium coeruleum	-hl	V	III	V	V	II	+	.	.	V	I	.	I	II	III	IV	I	IV	.	II
Ranunculus grandifolius	-hl	V	IV	IV	II	II	+	.	+	.	.	.	.	.	.	.	.	.	.	.
Cerastium pauciflorum	-hl	IV	V^2	II	V	V	I	.	.	III	III	I	.	I	II	III	I	V	I	V
Geranium albiflorum	-hl	II^2	II	II	III	IV	.	.	.	.	I	I	.	+	.	.	.	.	.	.
Senecio nemorensis	-hl	V	V^2	IV	+	.	+	.	.	.	III	I	.	.	.	II	.	I	I	.
D.S. Subass. ***A.c.-P.s. athyrietosum filix-feminae***																				
Anemonoides caerulea	-hl	V	IV	.	.	IV	IV	III	.	.	.	.	.	.	.	.	.	.	.	.
Athyrium filix-femina	-hl	V	V	+	.	II	+	.	.	.	.	I	.	.	.	.	.	I	.	.
Equisetum pratense	-hl	IV	IV	.	II	.	.	.	.	.	III	.	.	.	.	.	.	I	.	II
Adenophora liliifolia	-hl	IV	IV	II	.	II	+	.	+	.	.	.	.	.	.	.	.	.	.	.
Filipendula ulmaria	-hl	III	IV	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla fragarioides	-hl	II	IV	.	.	.	+	.	I	.	IV	V	.	+	.	.	.	.	.	.
Cypripedium macranthon	-hl	II	IV	.	III	.	.	.	+	.	I	II	IV	III	IV	.	I	.	I	+
Variant ***Circaea alpina***																				
Circaea alpina	-hl	V	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	I	.
Vicia sylvatica	-hl	IV	.	.	I	.	+	.	.	.	V	II	.	.	.	.	.	.	.	.
Corydalis bracteata	-hl	IV	.	.	+	.	I	.	.	.	.	.	.	+	+	.	.	.	.	.
D.S. Subass. ***A.c.-P.s. laricetosum***																				
Elymus mutabilis	-hl	.	.	V	I	.	.	.	+	V	.	.	III	III	III	III	IV	II	V	II
Geranium pratense	-hl	.	I	V	.	.	+	.	I	V^2	.	I	+	.	.	.	.	.	.	.
Poa urssulensis	-hl	.	II	V	+	.	.	.	II	V	.	II	III	I	II	.	.	I	II	+
Paeonia anomala	-hl	.	II	IV	II	II	.	.	.	V	.	.	+	II	III	V	.	V	II	III
Carex humilis	-hl	.	.	IV	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.
Adonis sibirica	-hl	III	I	IV	+	.	+	I	+	.	.	.	.	.	+	.	.	.	.	.
Bromopsis inermis	-hl	.	.	IV^2	+	.	+	.	+	.	.	.	.	+	+	.	.	.	.	.
Anthriscus sylvestris	-hl	I	III	IV	+	.	I	I	.	II	I	II	.	.	.	.	.	.	.	.
Elymus komarovii	-hl	.	.	III	.	.	.	.	.	V	.	.	.	.	.	III	.	I	V	.
D.S. Subass. ***A.c.-P.s. anemonoidetosum reflexae***																				
Anemonoides reflexa	-hl	.	.	.	IV	.	.	.	.	.	IV	IV	IV	III	III	IV	III	V	V	V
Adenophora lamarckii	-hl	.	.	.	III	.	.	.	.	.	IV	V	V	V	V	V	I	I	II	.
Anemonastrum crinitum	-hl	.	.	I	III	.	.	.	.	.	I	.	+	+	IV	.	.	.	.	.
D.S. Subass. ***A.c.-P.s. rhododendretosum davurici***																				
Rhododendron davuricum	-s1	III	.	.	+	V	+	.	II	.	.	.	.	.	.	.	I	V	I	.
Anthoxanthum odoratum	-hl	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vaccinium myrtillus	-hl	I	.	.	+	IV^2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Campanula altaica	-hl	II	.	.	.	IV	+	.	II	.	.	III	I	.	+	.	.	.	.	.
Viola biflora	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	+	.	.	.	.	.

Table III (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
D.S. Ass. ***Filipendulo vulgaris-Pinetum sylvestris***																				
Polygonatum odoratum	-hl	IV	V	+	I	II	V	I	V^2	.	V	V	II	I	.	.	.	.	I	+
Viola hirta	-hl	I	II	I	+	.	IV	V	III	IV	V	V	+	II	.	.	.	.	.	.
Origanum vulgare	-hl	II	III	+	.	.	IV	III	IV	IV	I	IV	.	+	.	.	.	.	.	.
Artemisia sericea	-hl	.	.	II	.	.	II	III	I	III	.	I	IV	.	III	.	.	.	.	.
Galium verum	-hl	.	.	I	+	.	II	.	III	IV	I	V	IV	I	II	.	.	.	II	.
Fragaria viridis	-hl	.	.	+	.	.	I	II	III^2	V^2	II	V	+	II	I	+	.	.	I	.
Filipendula vulgaris	-hl	I	I	.	.	.	V	V	IV	.	.	.	.	.	.	.	.	.	.	.
Peucedanum morisonii	-hl	.	.	.	.	.	IV	IV	II	I	.	.	.	.	.	.	.	.	.	.
Variant ***Rosa pimpinellifolia***																				
Rosa pimpinellifolia	-s1	.	.	.	.	.	.	V^2	.	III	.	.	.	.	.	.	.	.	.	.
Kadenia dubia	-hl	.	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***F.v.-P.s. spiraeetosum trilobatae***																				
Spiraea trilobata	-s1	.	.	.	.	.	I	.	V^2	.	.	.	.	.	.	.	.	.	.	.
Sedum hybridum	-hl	.	.	.	.	.	+	.	IV	.	.	I	.	.	.	.	.	.	.	.
Bupleurum multinerve	-hl	.	.	.	.	.	II	.	IV	I	.	.	II	.	+	.	I	.	.	.
Galium paniculatum	-hl	II	II	II	.	.	+	.	IV^2	.	.	.	.	.	.	.	.	.	.	.
Artemisia gmelinii	-hl	.	.	.	.	.	I	.	III	.	.	IV	.	.	.	.	.	.	.	.
Woodsia ilvensis	-hl	.	.	+	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.
Kitagawia baicalensis	-hl	.	.	.	.	.	.	.	III	.	.	I	.	.	.	.	.	.	.	.
Veronica krylovii	-hl	.	.	.	.	.	.	.	III	II	.	I	I	I	+	.	.	.	.	.
Elymus gmelinii	-hl	.	.	II	.	.	.	.	III	II	.	.	I	.	+	.	.	I	IV	.
D.S. Subass. ***F.v.-P.s. arabidetosum pendulae***																				
Valeriana alternifolia	-hl	.	I	II	+	.	.	.	II	V	.	.	III	.	I	.	.	.	.	.
Arabis pendula	-hl	.	.	I	+	.	.	.	I	V	.	.	.	.	.	.	.	.	.	.
Lithospermum officinale	-hl	.	.	.	.	.	.	.	I	V	.	.	.	.	.	.	.	.	.	.
Elymus caninus	-hl	I	I	III	.	.	+	.	.	V	I	I	.	.	.	.	I	I	.	II
Geum aleppicum	-hl	.	III	III	+	.	+	I	.	V	.	I	II	.	+	.	.	.	.	.
Ribes hispidulum	-s1	II	.	I	.	.	.	I	.	III	.	I	.	.	.	.	.	.	.	.
Hypericum hirsutum	-hl	.	.	.	.	.	.	III	.	III	.	.	.	.	.	.	.	.	.	.
Galatella macrosciadia	-hl	.	.	+	.	.	.	.	+	III	.	I	III	+	+	.	.	.	.	.
D.S. Subass. ***F.v.-P.s. brunneretosum sibiricae***																				
Brunnera sibirica	-hl	.	.	.	II	.	.	.	.	.	V^2	.	.	.	.	.	.	.	.	.
Lysimachia vulgaris	-hl	.	.	.	.	.	.	.	.	.	III	II	.	.	.	.	.	.	.	.
D.S. Subass. ***F.v.-P.s. violetosum arenariae***																				
Viola arenaria	-hl	.	I	.	.	.	+	I	I	.	.	V	III	II	III	+	V	I	I	+
Hemerocallis minor	-hl	.	.	.	.	.	.	.	.	.	III	V	II	III	.	.	.	.	.	.
Astragalus danicus	-hl	.	.	.	.	.	.	.	+	.	.	IV	+	II	+	.	.	.	.	.
Bupleurum scorzonerifolium	-hl	.	.	.	.	.	.	.	I	.	.	IV	.	.	.	.	.	.	.	.
Hylotelephium triphyllum	-hl	.	.	.	.	.	+	.	+	.	I	III	.	.	+	.	.	.	.	.
Carex obtusata	-hl	.	.	II	+	.	.	.	+	.	.	III	III	.	II	.	.	.	IV	.
Hypericum perforatum	-hl	.	.	.	.	.	.	II	.	.	.	III	.	.	.	.	.	.	.	.
D.S. Ass. ***Adenophoro lamarcki-Laricetum sibiricae***																				
Zigadenus sibiricus	-hl	III	.	.	I	II	.	.	.	.	I	II	V	III	IV	.	IV	V	II	+
Seseli libanotis	-hl	.	.	+	+	.	.	I	II	IV	.	.	IV	III	IV	.	.	.	.	.
Scorzonera radiata	-hl	.	.	.	+	.	.	.	.	.	I	II	III	II	IV	+	II	.	.	.
Crepis praemorsa	-hl	.	.	.	III	.	.	.	+	.	III	II	III	IV	III	.	.	.	I	.
Gentiana macrophylla	-hl	.	III	+	I	.	.	.	+	III	.	I	V	II	III	.	.	.	.	+
Adenophora coronopifolia	-hl	.	.	.	I	.	.	.	.	.	.	II	III	IV	I	.	.	.	.	.
Malaxis monophyllos	-hl	I	I	+	I	.	+	.	I	.	I	.	IV	III	II	II	III	I	I	+
Hedysarum neglectum	-hl	.	.	.	.	.	.	.	.	.	.	.	III	II	II	.	.	.	.	.
Primula cortusoides	-hl	.	I	I	+	.	.	.	I	.	.	.	V	V	II	.	.	.	I	.
Anemone sylvestris	-hl	.	.	.	+	.	.	.	I	.	I	II	V	I	III	+	.	I	II	.
Artemisia tanacetifolia	-hl	.	.	.	+	.	.	.	.	.	.	V	V	III	V	V	II	.	V	II
Thalictrum foetidum	-hl	.	I	II	II	.	.	.	III	I	.	.	V^2	V^2	V^2	V^2	V	I	V^2	II
D.S. Subass. ***A.l.-L.s. ligularietosum glaucae***																				
Ranunculus polyanthemos	-hl	.	III	+	.	.	+	.	.	.	I	II	V	IV	I	.	.	.	.	.
Viola mirabilis	-hl	IV	IV	+	.	.	III	IV	.	.	IV	III	IV	V	I	.	.	.	.	.

Table III (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Veratrum nigrum	-hl	III	V	II	+	.	I	.	I	II	II	III	III	IV	I	.	.	.	IV	I
Ligularia glauca	-hl	.	I	IV	II	.	.	.	.	.	.	.	IV	III	I	.	.	.	.	.
Neottianthe cucullata	-hl	.	.	.	+	.	+	.	I	.	.	II	IV	III	+	.	.	.	.	.
Rosa majalis	-s1	.	.	.	+	.	I	V	.	.	III	IV	II	IV	.	.	.	.	.	.
Aulacospermum anomalum	-hl	.	.	.	+	.	.	.	I	.	I	.	IV	II	+	.	.	.	.	.
Polygonatum humile	-hl	.	.	.	.	.	.	.	.	.	.	.	II	V	+	.	.	.	.	.
Variant ***Filipendula stepposa***																				
Filipendula stepposa	-hl	.	.	.	.	.	.	.	+	.	.	.	V	I	+	.	.	.	.	.
Galatella biflora	-hl	.	.	+	+	.	.	.	.	.	.	I	IV	I	+	.	.	.	.	.
Achnatherum sibiricum	-hl	.	.	.	.	.	.	.	I	.	.	.	III	.	I	.	.	.	I	.
D.S. Subass. ***A.l.-P.s. anemonastretosum crinitae***																				
Bistorta vivipara	-hl	I	.	.	I	.	.	.	+	.	.	.	II	.	III	.	I	.	I	.
Astragalus propinquus	-hl	.	.	.	+	.	.	.	.	.	.	.	+	.	III	.	.	.	.	.
D.S. Ass. ***Calamagrostio pavlovi-Laricetum sibiricae***																				
Carex amgunensis	-hl	.	.	.	.	.	.	.	.	.	.	.	III	.	III	V	V	V^2	V^2	IV
Calamagrostis pavlovii	-hl	.	.	.	I	.	.	.	.	.	.	.	III^2	I	IV^2	V^2	V^2	V^2	V^2	V^2
Pyrola incarnata	-hl	.	.	.	I	.	.	.	.	.	.	.	III	III	II	IV	IV	V	V	III
Pyrola rotundifolia	-hl	.	.	.	+	.	.	.	.	.	.	.	.	.	III	IV	IV	IV	III	III
Vicia cracca	-hl	III	II	I	II	.	II	.	II	.	.	.	.	.	II	V	V	V	IV	V
Orthilia secunda	-hl	.	.	.	I	.	.	.	.	.	II	II	I	I	II	III	IV	II	V	.
Pinus sibirica	-s1	.	.	.	I	.	+	.	+	.	.	I	.	.	.	V	I	V	V	V
Vaccinium vitis-idaea	-hl	.	.	.	+	V	.	.	.	.	.	.	.	.	.	.	IV	V	I	III
Picea obovata	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	II	.	III
Hylocomium splendens	-ml	I	.	+	.	.	+	.	.	.	.	III	+	I	I	IV	III	V	V^2	II
Pedicularis resupinata	-hl	II	.	+	II	.	.	.	.	.	.	I	+	.	II	III	I	V	II	IV
Variant ***Spiraea media***																				
Spiraea media	-s1	I	II	.	I	.	III	V^3	I	.	III	IV	II	IV	I	.	V^2	.	.	V
Variant ***Bergenia crassifolia***																				
Bergenia crassifolia	-hl	.	.	.	.	II	.	.	+	.	.	.	.	.	.	.	.	IV	.	.
Variant ***Dracocephalum ruyschiana***																				
Dracocephalum ruyschiana	-hl	I	.	+	+	.	III	II	II	.	.	II	IV	IV	IV	.	I	.	IV	+
Carex caryophyllea	-hl	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	IV	+
Variant ***Allium microdictyon***																				
Cirsium komarovii	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	V
Allium microdictyon	-hl	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	I	.	.	IV
D.S. Suball. ***Cruciato krylovii-Pinenion sylvestris***																				
Erythronium sibiricum	-hl	V	V	IV	V	V	V	IV	II	V	V	V	V	IV	IV	V	IV	V	V	V
Cruciata krylovii	-hl	V^2	V^2	V^2	IV^2	V	V	V	II	V	V^2	V	.	.	I	III	I	I	V	V
Lathyrus frolovii	-hl	IV	IV	IV	V^2	V	III	.	.	.	V	III	IV	V^2	V^2	.	.	.	.	.
Spiraea chamaedryfolia	-s1	V^2	IV^2	IV^3	III	IV	II^2	I	II	III	V	V	III^2	II^2	V^2	V^2	V^2	V^2	III^2	V^2
Primula macrocalyx	-hl	V^2	V^2	V^2	V	.	IV	III	IV	V^2	I	.	V	V^2	V	.	.	.	.	.
Aconitum krylovii	-hl	V^2	V^2	V^2	.	III	I	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. All. ***Vicio unijugae-Pinion sylvestris***																				
Geranium pseudosibiricum	-hl	IV^2	V	V^2	IV^2	III	V	V	III^2	IV^2	V	V	V^2	V	V^2	V	V^2	III	V	V^2
Lupinaster pentaphyllus	-hl	IV	V	V	V	V	IV	V	V	III	V	V	V	V	V	III	V	I	III	V
Lathyrus pisiformis	-hl	IV	V	+	III	.	III	III	I	.	V	V	III	III	III	.	I	.	.	II
Vicia unijuga	-hl	V	V^2	+	V	.	V	V	IV	III	V	V	V^2	V	V^2	.	.	.	V	.
Saussurea controversa	-hl	IV	III	IV^2	III	III	+	.	I	I	I	.	V	V	V	V	I	V	V	V
Inula salicina	-hl	.	.	.	+	.	III	.	II	.	IV	V	I	IV	.	.	.	.	.	.
Ptarmica impatiens	-hl	V	IV	II	IV	IV	I	.	.	.	II	I	.	IV	III	.	I	.	.	I
Aquilegia sibirica	-hl	V	III	I	IV	IV	I	.	I	.	II	.	III	+	IV	III	V	V	V	V
D.S. All. ***Lathyro gmelinii-Pinion sylvestris***																				
Populus tremula	-t1	I	I	.	III^2	.	I	I	.	.	II	I	I	III	I	.	I	III^2	.	III^2
Milium effusum	-hl	IV	III	II	+	II	II	.	.	IV	II	I	.	.	.	.	.	.	.	.
Aconitum septentrionale	-hl	II	.	+	IV^2	.	+	II	.	I	.	.	.	+	+	.	I	.	I	III

Table III (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Stellaria bungeana	-hl	IV	.	I	.	.	+	.	.	.	.	.	.	.	.	+	.	I	.	.
Calamagrostis obtusata	-hl	.	.	+	II	II	.	.	.	.	.	.	I	.	I	.	.	.	.	I
Veratrum lobelianum	-hl	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Paris quadrifolia	-hl	I	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Ord. ***Carici macrourae-Pinetalia sylvestris***																				
Carex macroura	-hl	V²	V²	IV²	V²	IV²	V²	V²	IV²	III²	V²	V²	IV²	V²	II²	V²	V²	V²	V²	V²
Cimicifuga foetida	-hl	IV	V	II	V	V	IV	.	II	II	V	V	IV²	V	V²	V	V	III	V	V
Heracleum dissectum	-hl	V	III	III	V	II	III	.	II	II	V²	IV	IV	IV	V	V	I	V	.	II
Viola uniflora	-hl	V	V	IV	V²	V	II	.	.	.	III	I	V²	V²	IV	V	IV	V	IV	V
Trollius asiaticus	-hl	V²	V	V	V	IV	I	.	.	.	II	II	III	IV	V	+	I	II	I	III
Aconitum volubile	-hl	IV	V	IV	V	.	I	.	+	III	V	IV	.	IV	+	.	I	I	III	III
Bupleurum aureum	-hl	IV²	III	IV	III	IV²	IV	V	I	III	V	V	.	I	.	.	.	.	.	.
Pteridium aquilinum	-hl	V²	I	.	III²	.	III²	.	+	.	V²	V²	.	.	.	.	.	.	.	II
D.S. Cl. ***Brachypodio pinnati-Betuletea pendulae***																				
Lilium pilosiusculum	-hl	V	III	III	V	V	IV	V	+	III	V	IV	V	V	V	V	V	V	III	V
Rubus saxatilis	-hl	V²	V²	IV²	V²	V²	V	V²	III²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²
Iris ruthenica	-hl	IV²	V²	V²	V²	V²	IV	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²
Pleurospermum uralense	-hl	V	V	I	V	III	IV	IV	+	II	V	IV	IV	V	V	IV	I	.	.	III
Hieracium umbellatum	-hl	IV	III	+	III	V	II	II	III	I	V	V	V	V	V	.	I	.	II	III
Calamagrostis arundinacea	-hl	V²	IV²	.	IV²	V²	V²	V	IV	.	V²	V²	III²	V²	I	.	.	I	.	.
Brachypodium pinnatum	-hl	V²	V²	V²	V²	III²	V²	V²	III²	I	V²	V²	II²	V²	I	.	.	.	.	.
Pulmonaria mollis	-hl	V	V	V	V	.	V	V	III	IV	V	V	V	V	IV	.	I	.	.	V
Agrimonia pilosa	-hl	IV	IV	II	.	.	II	III	III	V	III	V	IV	II	I	.	.	.	III	.
Vicia sepium	-hl	IV	III	II	III	II	I	II	.	I	V	III	+	I	+	.	.	.	.	.
Angelica sylvestris	-hl	V	V	+	IV	III	III	III	+	III²	V²	IV	.	I	.	.	.	.	.	.
Serratula coronata	-hl	IV	III	II	II	.	II	II	III	.	V	V	I	II	+	.	.	.	.	.
D.S. Cl. ***Rhytidio-Laricetea***																				
Poa sibirica	-hl	IV	III	V	V	III	II	.	I	IV	III	II	V	V	V	V	V	V	V²	V
Aconitum barbatum	-hl	.	.	III	II	.	+	.	IV²	.	V	V	V²	V²	V	V	V	IV	IV	III
Carex pediformis inc. *C. kirilowii*	-hl	.	.	.	I	.	+	.	IV²	III	.	I	V²	II	V²	IV	V	V	III	III
Pulsatilla patens	-hl	I	.	+	I	III	+	II	III	.	I	IV	V	III	V	+	V	.	IV	I
Aster alpinus	-hl	.	.	.	.	.	.	.	+	.	.	I	III	.	II	.	.	.	.	.
Rhytidium rugosum	-ml	.	.	+	.	.	+	.	I	.	.	.	II	.	I	IV	.	.	III	.
D.S. Cl. ***Querco-Fagetea***																				
Melica nutans	-hl	V	III	.	II	.	III	V	I	.	III	II	.	II	.	.	.	.	.	.
Adoxa moschatellina	-hl	V	III	IV	I	.	+	.	.	I	.	.	.	.	I	.	.	.	.	.
Poa nemoralis	-hl	.	.	.	.	II	.	.	III	.	.	.	I	.	.	.	.	.	.	.
Viburnum opulus	-sl	II	.	.	.	.	+	III	.	.	I	II	.	.	.	.	.	.	.	.
Galium odoratum	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lathyrus vernus	-hl	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Brachypodium sylvaticum	-hl	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.
Dryopteris filix-mas	-hl	.	.	.	.	.	I	.	.	.	.	I	.	.	.	.	.	.	.	.
Aegopodium podagraria	-hl	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca gigantea	-hl	.	.	.	.	.	+	I	.	.	.	.	.	.	.	.	.	.	.	.
Epipactis helleborine	-hl	.	.	.	.	.	.	I	.	I	.	.	.	.	.	.	.	.	.	.
D.S. Cl. ***Molinio-Arrhenatheretea***																				
Galium boreale	-hl	V	V	V	V	IV	V	V	IV	V	IV	IV	V	V	IV	V	V	V	V	V
Sanguisorba officinalis	-hl	V	IV	IV	IV	.	III	III	III	III	V	V	V	V	IV	.	I	I	V	I
Dactylis glomerata	-hl	III	III	IV²	I	II	III	V	I	V²	IV	V	.	.	.	.	.	.	.	.
Festuca rubra	-hl	II	III	+	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lathyrus pratensis	-hl	.	I	I	II	.	+	.	.	I	I	.	I	.	I	+	.	.	.	.
Trifolium pratense	-hl	.	.	.	.	.	+	.	.	.	.	II	+	+	.	.	.	.	.	.
Phleum pratense	-hl	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.
Alopecurus pratensis	-hl	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agrostis gigantea	-hl	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Leucanthemum vulgare	-hl	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca pratensis	-hl	.	I	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table III (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
D.S. Cl. ***Vaccinio-Piceetea***																				
Pleurozium schreberi	-ml	II	III	III^2	II	.	III^2	V^2	+	I	IV	V	V	II	III	V	V	V	V^2	V
Ptilium crista-castrensis	-ml	I	I	.	I	.	II	V	+	.	II	IV	I	I	I	+	V	III	I	II
Linnaea borealis	-hl	.	.	.	.	II	.	.	.	.	.	.	.	.	.	+	.	III	.	II
Lonicera altaica	-s1	I	.	.	.	II	.	.	+	.	.	.	.	.	.	.	.	III	.	II
Lycopodium annotinum	-hl	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trientalis europaea	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	I	.
Dicranum polysetum	-ml	I	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	I	I	.
Other species:																				
Thalictrum minus	-hl	V^2	V^2	V	V^2	IV	V	V	IV	.	V	V	V^2	V	V	V	V^2	V^2	IV	V
Lathyrus humilis	-hl	I	I	V	IV	IV	III	V	II	V	V	V	V	V	IV	V^2	V^2	V^2	V^2	V^2
Achillea asiatica	-hl	I	I	V	III	.	III	II	IV	IV	I	III	V	V	V	III	I	.	IV	IV
Trisetum sibiricum	-hl	V	III	V	V	II	+	.	I	I	I	.	III	IV	II	V	I	III	IV	III
Helictotrichon pubescens	-hl	IV	V	V	II	III	I	.	III	I	I	II	III	I	III	II	IV	.	IV	.
Rosa acicularis	-s1	I	I	I	III	.	III	.	II	V	II	II	III	II	II	V	V	II	V	V
Euphorbia pilosa	-hl	V	IV	III	III	II	II	.	+	.	III	V	.	II	.	.	.	.	.	.
Crepis sibirica	-hl	V	V^2	V	IV	IV	II	I	+	IV	V^2	V	+	V^2	I	V	II	.	.	III
Cotoneaster melanocarpus	-s1	II	III	II	+	.	IV	III	V^2	V	I	III	III	II	II	III	V	III	V	II
Vicia megalotropis	-hl	IV	III	V	IV	III	+	III	+	.	III	V	V	IV	III	.	.	.	.	.
Maianthemum bifolium	-hl	III	II	.	V	V	+	.	.	.	V	III	II	IV	III	V	V	V	IV	V
Phlomoides tuberosa	-hl	II	.	III	II	.	IV	IV	V	V	V	V	V	V	II	II	II	.	III	II
Atragene sibirica	-hl	V	I	II	IV	V	+	.	I	.	.	.	II	III	IV	V	IV^2	V^2	II	V
Campanula glomerata	-hl	.	II	III	III	.	I	.	II	II	IV	V	V	V	V	I	II	.	I	.
Cypripedium guttatum	-hl	IV	IV	.	III	V	.	.	.	.	I	I	I	III	IV	+	.	III	.	+
Dianthus superbus	-hl	II	II	+	II	II	+	.	+	.	IV	III	II	III	II	II	IV	I	IV	III
Caragana arborescens	-s1	II^2	III^2	II	.	.	IV^2	I^2	IV^2	I	.	II	.	.	.	III	V^2	II	II	V^2
Euphorbia discolor	-hl	IV	IV	IV	+	IV	V	.	III	I	I	II	IV	II	II	.	.	.	.	.
Solidago virgaurea	-hl	II	III	II	I	III	III	IV	II	IV	.	I	+	IV	+	.	I	.	.	III
Cirsium serratuloides	-hl	IV	IV	IV	.	.	III	.	III	.	I	III	.	.	.	.	.	.	.	.
Sorbus sibirica	-s1	IV	III	.	I	III	III	V^2	+	.	II	IV	.	.	.	.	.	.	.	.
Padus avium	-s1	IV	IV	.	I	II	II	III	+	.	V	V	.	+	.	.	.	.	.	.
Fragaria vesca	-hl	IV	III	+	+	.	IV	V	II	.	III	III	.	+	+	.	.	.	.	+
Larix sibirica	-s1	.	.	II	I	.	.	.	.	III	.	.	II	.	II	I	IV	II	.	II
Betula pendula	-s1	II	.	.	I	I	III	III	.	.	.	.	II	III	II	.	.	IV	II	.
Pinus sylvestris	-s1	III	I	II	III	III	II	III	IV	.	II	II	.	.	.	.	.	.	.	II
Oberna behen	-hl	IV	II	IV	I	.	+	.	+	II	.	II	I	.	I	.	.	.	.	.
Rhytidiadelphus triquetrus	-ml	II	III^2	I	+	.	+	I	.	.	.	III	II	I	II	II	V	III	IV^2	II
Ranunculus propinquus	-hl	.	.	.	III	.	.	.	.	.	I	.	III	I	II	I	I	III	II	I
Vicia nervata	-hl	.	.	+	.	.	+	.	III	II	I	II	III	II	III	.	III	I	V	I
Anemonoides jenisseens	-hl	.	.	.	II	.	.	.	.	.	II	II	+	II	II	I	II	IV	V	V
Veronica chamaedrys	-hl	I	I	.	.	.	.	V	+	.	IV	V	.	.	.	.	.	.	.	.
Urtica dioica	-hl	IV	III	II	.	.	+	.	+	IV	.	.	.	.	.	.	.	.	.	.
Tephroseris integrifolius	-hl	III	I	II	I	II	+	.	II	I	I	I	.	+	+	.	.	.	II	.
Crepis lyrata	-hl	IV	III	II	+	.	+	.	.	III	.	.	.	.	.	.	.	.	.	.
Luzula pilosa	-hl	II	I	.	II	IV	II	.	.	.	III	II	.	.	.	.	.	I	II	.
Pedicularis incarnata	-hl	I	.	+	I	IV	+	.	+	.	.	.	+	II	III	.	I	.	.	.
Viola montana	-hl	.	.	.	.	.	II	III	I	.	III	V	.	.	.	.	.	.	.	+
Artemisia integrifolia	-hl	.	.	.	+	.	.	.	.	.	III	V	II	+	I	.	.	.	.	.
Bromopsis pumpelliana	-hl	.	.	.	II	.	.	.	.	.	.	.	V	IV	V^2	V	.	.	III	.
Lamium album	-hl	III	III	III	I	.	+	.	.	I	.	.	.	.	+	II	.	.	.	.
Aconogonon alpinum	-hl	II	III	II	+	.	II	.	III	I	.	.	I	.	.	.	.	.	.	.
Conioselinum tataricum	-hl	I	III	II	+	.	I	I	.	.	.	.	I	+	I	.	.	.	.	.
Mnium species	-ml	.	III	+	+	.	.	.	.	.	.	.	+	+	I	.	.	.	.	.
Rhodobryum roseum	-ml	.	III	II	+	.	+	.	.	.	.	.	I	.	I	.	.	.	.	.
Hesperis sibirica	-hl	.	III	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla chrysantha	-hl	.	.	III	.	.	III	.	III	II	.	.	.	I	+	.	.	.	.	.
Trommsdorfia maculata	-hl	.	.	.	II	III	+	.	III	.	III	III	II	II	II	.	.	.	.	.
Abies sibirica	-s1	.	.	.	I	.	I	III	.	.	.	.	.	.	.	.	.	.	.	.
Platanthera bifolia	-hl	I	.	.	+	.	.	III	I	.	I	II	.	I	+	.	.	.	.	.
Dracocephalum nutans	-hl	.	.	.	.	.	.	.	III	II	.	.	.	.	.	.	.	.	.	.
Carduus crispus	-hl	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Salix caprea	-s1	I	.	.	I	.	I	.	.	.	III	.	.	+	.	.	.	.	.	.

Table III (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Equisetum sylvaticum	-hl	.	.	.	+	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.
Chamaenerion angustifolium	-hl	II	.	+	I	II	I	.	.	.	III	II	+	II	+	.	.	.	I	II
Scorpidium scorpioides	-ml	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.
Galium palustre	-hl	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.
Melandrium album	-hl	.	I	.	.	.	.	.	+	.	II	III	.	.	.	.	.	.	.	.
Potentilla flagellaris	-hl	.	.	.	.	.	.	.	I	.	.	III	.	.	.	.	.	.	.	.
Campanula rotundifolia	-hl	.	.	+	.	.	.	.	.	.	.	.	III	+	II	+	I	II	.	+
Artemisia macrantha	-hl	.	I	+	.	.	+	.	II	.	.	.	II	I	I	III	.	.	.	.
Anemonoides altaica	-hl	II	II	.	I	.	.	.	.	.	.	.	.	I	+	+	I	.	.	.
Moehringia lateriflora	-hl	II	.	.	+	.	+	.	.	.	.	I	.	+	.	I	.	.	.	.
Cerastium davuricum	-hl	II	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubus idaeus	-s1	II	I	.	.	.	II	II	I	.	.	.	.	.	.	.	.	.	.	.
Impatiens noli-tangere	-hl	II	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Gymnocarpium robertianum	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Humulus lupulus	-hl	II	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Dentaria sibirica	-hl	II	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cystopteris fragilis	-hl	II	.	+	.	.	+	.	II	.	.	.	.	.	.	.	.	.	.	.
Myosotis krylovii	-hl	II	.	.	.	II	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex arnellii	-hl	II	I	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Elymus sibiricus	-hl	.	II	II	.	.	+	.	.	I	.	.	.	.	.	.	.	.	.	.
Stellaria crassifolia	-hl	.	II	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sanicula giraldii	-hl	I	II	.	.	II	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Melilotoides platycarpos	-hl	.	.	II	II	.	.	.	.	I	.	.	.	II	I	.	.	.	.	.
Thalictrum simplex	-hl	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Salix bebbiana	-s1	.	.	.	II	.	.	.	.	.	.	.	+	I	II	.	.	.	.	+
Gymnocarpium dryopteris	-hl	I	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	I	.	.
Dactylorhiza fuchsii	-hl	I	.	.	.	II	.	I	.	.	I	.	+	+	+	.	.	.	.	.
Dryopteris expansa	-hl	I	I	.	.	II	+	II	.	.	.	.	.	.	.	.	.	.	.	.
Aconitum anthoroideum	-hl	.	.	I	.	.	II	.	II	II	I	II	.	.	.	.	.	.	.	.
Caragana frutex	-s1	.	.	.	+	.	II	.	.	.	II	.	.	.	.	.	.	.	.	.
Lonicera tatarica	-s1	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.
Caragana pygmaea	-s1	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	I	.	I	+
Euphorbia alpina	-hl	.	.	.	.	.	+	.	II	.	.	.	.	.	.	.	.	.	.	.
Dendranthema sinuatum	-hl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.
Tragopogon orientalis	-hl	.	.	.	.	.	.	.	II	.	.	II	I	+	+	.	.	.	.	.
Calamagrostis epigeios	-hl	.	.	.	.	.	+	.	II	II	.	II	II	.	I	.	.	.	.	.
Polygala comosa	-hl	.	.	.	+	.	.	.	II	.	.	I	+	.	+	.	.	.	.	.
Schizonepeta multifida	-hl	.	.	.	.	.	.	.	II	.	.	.	I	.	+	.	.	.	.	.
Allium nutans	-hl	.	.	.	.	.	.	.	II	.	.	.	.	+	.	.	.	.	.	.
Phleum phleoides	-hl	.	.	+	.	.	.	.	II	II	.	.	I	.	+	.	.	.	.	.
Elytrigia repens	-hl	I	.	+	.	.	.	.	.	II	.	.	.	.	+	.	.	.	.	.
Artemisia vulgaris	-hl	I	I	I	.	.	.	.	I	II	.	.	.	.	.	.	.	.	.	.
Elytrigia gmelinii	-hl	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Artemisia laciniata	-hl	.	.	+	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Hieracium virosum	-hl	.	.	.	+	.	+	.	.	.	II	.	.	.	.	.	.	.	.	.
Galatella angustissima	-hl	.	.	.	.	.	.	.	.	.	I	II	.	+	.	.	.	.	.	.
Stellaria media	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.
Myosotis imitata	-hl	.	.	I	.	.	+	.	I	.	.	.	II	.	.	.	.	.	.	.
Viola dissecta	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.
Thesium repens	-hl	.	.	.	+	.	.	.	.	.	.	.	+	.	II	.	.	.	.	.
Vicia amoena	-hl	.	.	.	+	.	.	.	+	.	.	.	I	I	II	.	.	.	I	.
Elymus transbaicalensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Rubus matsumuranus	-s1	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	I	.

Table III (continuation)

Species with few occurrences:

Abietinella abietina (ml) - 3(I), 8(I), 12(I), 14(+), *Adenophora tricuspidata* (hl) - 13(+), 14(+), *Alchemilla* sp. (hl) - 3(+), *Alfredia cernua* (hl) - 3(+), 6(+), *Allium rubens* (hl) - 8(+), *A. strictum* (hl) - 8(I), 13(+), 14(I), 15(+), *Anagallidium dichotomum* (hl) - 8(+), *Androsace septentrionalis* (hl) - 8(I), *Antennaria dioica* (hl) - 6(I), 7(I), 11(I), *Artemisia commutata* (hl) - 8(I), *A. latifolia* (hl) - 3(+), 9(I), *A. santolinifolia* (hl) - 15(+), *Asparagus officinalis* (hl) - 8(+), *Asplenium septentrionale* (hl) - 8(I), *Botrychium lunaria* (hl) - 14(+), *Bromopsis benekenii* (hl) - 7(I), *Campanula bononiensis* (hl) - 7(I), *C. cervicaria* (hl) - 6(+), *Carex korshinskyi* (hl) - 8(+), *C. muricata* (hl) - 2(I), *Centaurea scabiosa* (hl) - 8(+), *C. sibirica* (hl) - 8(I), *Cerastium arvense* (hl) - 8(I), *Chelidonium majus* (hl) - 8(I), *Cinna latifolia* (hl) - 1(I), *Cotoneaster uniflorus* (s1) - 3(+), *Crataegus sanguinea* (s1) - 8(I), 10(I), 11(I), *Dactylorhiza maculata* (hl) - 4(+), *Delphinium elatum* (hl) - 2(I), 3(+), *D. laxiflorum* (hl) - 6(+), 8(I), *D. retropilosum* (hl) -13(I), *Dendranthema zawadskii* (hl) - 4(+), *Dianthus versicolor* (hl) - 6(+), 8(I), *Digitalis grandiflora* (hl) - 6(I), *Diplazium sibiricum* (hl) - 1(I), *Dryopteris carthusiana* (hl) - 5(+), 6(+), *Epipactis palustris* (hl) - 11(I), *Equisetum hyemale* (hl) - 1(I), *Erigeron krylovii* (hl) - 3(+), 9(I), *Eritrichium pectinatum* (hl) - 8(+), *Euphorbia microcarpa* (hl) - 6(+), *Euphrasia parviflora* (hl) - 6(+), *Festuca extremiorientalis* (hl) - 1(I), *F. pseudovina* (hl) - 3(+), 14(+), *Frangula alnus* (s1) - 1(I), 6(+), *Galeopsis bifida* (hl) - 2(I), *Galatella hauptii* (hl) - 8(+), *Galium aparine* (hl) - 7(I), 9(I), *Gentianella amarella* (hl) - 3(+), 9(I), *Gypsophila altissima* (hl) - 6(+), 8(I), *Gentianopsis barbata* (hl) - 3(+), *Glechoma hederacea* (hl) - 2(I), *Hedysarum gmelinii* (hl) - 3(+), 8(+), 14(I), *Helictotrichon altaicum* (hl) - 8(I), *Hierochloe odorata* (hl) - 1(I), 13(+), 14(+), *Hieracium x robustum* (hl) - 5(+), *H. echioides* (hl) - 8(I), *H. korshinskyi* (hl) - 5(+), *H. pilosella* (hl) - 14(I), *Hylotelephium populifolium* (hl) - 19(+), *Hypericum elegans* (hl) - 6(+), 8(I), *Iris humilis* (hl) - 8(+), *Juniperus sabina* (s1) - 8(+), *Koeleria cristata* (hl) - 3(+), 8(+), *K. delavignei* (hl) - 1(I), *Lactuca sibirica* (hl) - 5(+), 10(I), *Lappula squarrosa* (hl) - 3(+), 8(I), *Ligularia abakanica* (hl) - 5(+), *L. sibirica* (hl) - 3(+), 5(+), *Linaria vulgaris* (hl) - 6(+), *Listera ovata* (hl) - 5(+), *Lonicera pallasii* (s1) - 19(I), *Luzula multiflora* (hl) - 1(I), *L. rufescens* (hl) - 14(+), *Medicago falcata* (hl) - 8(I), *Myosotis suaveolens* (hl) - 5(+), *Neottia camtschatea* (hl) - 16(I), 17(I), *Nepeta sibirica* (hl) - 1(I), 10(I), 11(I), *Onobrychis sibirica* (hl) – 8(+), *Onosma simplicissima* (hl) - 8(I), *Orostachys spinosa* (hl) - 8(I), *Oxytropis campanulata* (hl) - 14(+), *Parnassia palustris* (hl) - 3(+), *Pedicularis elata* (hl) - 10(I), *P. sibirica* (hl) - 5(+), 8(I), 12(I), 14(I), *Pimpinella saxifraga* (hl) - 11(I), *Plantago urvillei* (hl) - 6(+), 11(I), 12(I), 13(+), *Poa angustifolia* (hl) - 11(I), *P. botryoides* (hl) - 8(+), *Polypodium vulgare* (hl) - 1(I) 6(+), 8(+), *Potentilla longifolia* (hl) - 8(I), *P. matsuokana* (hl) - 14(+), *P. tanacetifolia* (hl) - 8(+), *Pyrola chlorantha* (hl) - 14(+), 15(+), *Ribes nigrum* (s1) - 1(I), *Scabiosa ochroleuca* (hl) - 8(+), *Schizachne callosa* (hl) - 2(I), 6(+), 18(I), *Scutellaria galericula* (hl) - 11(I), *S. scordiifolia* (hl) - 8(I), *Sedum aizoon* (hl) - 3(+), 6(I), 8(I), 12 (+), 13(+), 14(+), *Senecio erucifolius* (hl) - 3(+), *Seseli buchtormense* (hl) - 8(I), *Silene graminifolia* (hl) - 8(I), *S. nutans* (hl) - 2(I), 4(+), 6(+), 7(I), 8(I), 12(+), 13(I), 14(+), *S. repens* (hl) - 3(+), 6(+), 7(I), 12(+), 13(+), 14(I), 17(I), *Swertia obtusa* (hl) - 3(+), *Tanacetum vulgare* (hl) – 14(+), *Taraxacum officinale* (hl) - 11(I), *Thalictrum petaloideum* (hl) - 8(+), 12(+), 14(I), *Thymus serpyllum* (hl) - 8(I), *Tulotis fuscescens* (hl) - 2(I), *Veronica incana* (hl) - 8(I), 11(I), 14(+), *V. longifolia* (hl) - 14(+), *V. porphyriana* (hl) - 8(+), *V. spicata* (hl) - 8(I), *Vicia lilacina* (hl) - 4(+), 14(+), *V. tenuifolia* (hl) - 7(I), *Viola dactyloides* (hl) - 11(I), *V. macroceras* (hl) - 8(+).

Table IV — Suballiances *Vicio unijugae-Pinenion* and *Achyrophoro-Pinenion*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Mean altitude (m)		290	310	310	270	330	800	200	300	350	370	340	300	350	550	360	630	900
Mean cover of tree layer %		64	50	53	59	54	56	49	50	63	58	60	52	56	51	55	64	60
Mean cover of shrub layer (%)		1	10	9	4	6	33	1	5	4	8	1	4	2	4	3	9	5
Mean cover of herb layer (%)		80	67	69	78	67	82	92	70	42	69	45	68	72	74	72	73	74
Mean cover of moss layer (%)		0	4	0	+	1	7	0	13	2	2	+	+	+	0	1	+	3
Mean heigt of tree layer (m)		19	20	20	19	22	24	22	22	20	21	21	19	20	18	22	23	23
Mean heigh of shrub layer (cm)		46	52	50	94	53	88	87	73	62	64	48	46	43	49	62	55	58
Mean height of herb layer (cm)		43	38	41	68	64	71	82	48	37	34	36	42	47	45	52	51	50
Mean nr. of specie in one relevé		71	62	55	58	55	67	48	63	38	46	42	53	55	54	54	57	51
Relevé area (m^2)		200	200	650	200	200	200	200	650	400	400	400	200	200	200	200	400	200
Number of species		122	170	153	209	189	111	118	163	74	141	79	82	193	84	228	102	121
Number of relevés		9	5	11	23	15	6	11	10	6	12	10	6	17	4	56	7	9
The main species of tree layer																		
Betula pendula	-t1	V⁴	V²	V⁴	V⁴	V⁴	V²	V⁴	V	III	V	V	V²	V²	4⁴	V²	.	.
Pinus sylvestris	-t1	.	V³	II⁴	I³	II⁴	V⁴	V²	V⁴	V⁴	V⁴	V⁴	V⁴	V⁴	4²	V⁴	V³	V³
Populus tremula	-t1	I	.	II	II²	.	V	I	+	I	II	I	II	I	.	II²	III	IV²
Larix sibirica	-t1	.	III	+	.	.	.	.	IV	II	III	V²	I	II²	.	IV²	.	I³
D.S. Ass. ***Artemisio latifoliae-Betuletum pendulae***																		
Galium verum	-hl	V	IV	V	II	II	II	.	.	.	.	.	.	III	3	.	.	.
Peucedanum morisonii	-hl	V	III	V	+	+	III	.	.	.	.	.	.	.	.	.	.	.
Artemisia latifolia	-hl	IV	V	V	+	II	.	.	II	.	.	.	.	II	.	+	.	.
Artemisia macrantha	-hl	IV	IV	V	+	.	I	.	II	.	.	.	.	I	.	.	.	.
Veratrum nigrum	-hl	IV	II	V	II	II	V	.	+	.	+	+	.	II	3	+	.	.
Silene nutans	-hl	IV	V	I	+	+	.	+	II	.	I	.	IV	III	2	+	.	.
Primula cortusoides	-hl	IV	IV	II	+	I	.	.	II	.	.	.	.	.	.	.	.	.
Calamagrostis epigeios	-hl	III	III	I	I	I	V²	II	+	.	I	.	.	III	.	I	I	.
D.S. Subass. ***A.l.-B.p. ligularietosum glaucae***																		
Galatella biflora	-hl	V	.	.	.	+	V	.	.	.	.	.	.	.	.	.	.	.
Ligularia glauca	-hl	V	I	I	+	+	II	.	.	.	.	.	.	.	.	.	.	.
Trisetum sibiricum	-hl	V	.	II	+	.	.	.	.	.	.	.	I	+	1	+	III	II
Poa urssulensis	-hl	IV	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia vulgaris	-hl	IV	I	.	II	I	II	III	.	.	.	.	.	II	.	+	.	III
Festuca rubra	-hl	IV	.	+	.	I	.	+	.	.	.	.	.	.	.	.	.	.
Pimpinella saxifraga	-hl	IV	I	.	I	I	.	+	.	.	.	.	.	+	.	.	.	.
D.S. Subass. ***A.l.-B.p. pinetosum sylvestris***																		
Orthilia secunda	-hl	I	IV	.	I	I	.	.	V	III	IV	II	V	I	.	II	II	I
Sorbus sibirica	-s1	.	III	+	II	II	.	.	V	.	II	.	.	.	.	+	.	.
Thalictrum foetidum	-hl	.	III	I	+	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S Ass. ***Calamagrostio arundinaceae-Betuletum*** = D.S. Suball. ***Vicio unijugae-Pinenion sylvestris***																		
Geranium bifolium	-hl	V	V	V	IV	IV	.	I	V	.	.	.	.	.	.	.	.	.
Ranunculus polyanthemos	-hl	V	II	III	V	IV	IV	III	II	.	.	.	II	II	1	+	.	.
Viola hirta	-hl	V	III	III	V	IV	V	IV	+	.	.	.	.	I	2	+	.	.
Seseli libanotis	-hl	IV	IV	IV	II	III	III	I	II	.	.	.	.	II	.	.	.	.
Origanum vulgare	-hl	V	IV	II	IV	III	V	IV	.	.	.	.	.	III	.	+	.	.
Vicia tenuifolia	-hl	IV	IV	.	II	I	V	.	II	.	.	.	.	+	.	.	.	.
Rosa majalis	-s1	IV	IV	IV	II	IV	I	I	III	.	II	.	I	+	.	+	.	.
Poa angustifolia	-hl	IV	IV	IV	IV	IV	II	II	+	.	.	.	.	I	.	.	.	.
Filipendula vulgaris	-hl	V	IV	V	II	V	III	.	.	.	.	.	.	.	.	.	.	.
Adenophora liliifolia	-hl	V	II	III	II	I	III	.	+	.	.	.	.	.	.	.	.	.
Polygonatum humile	-hl	IV	III	.	II	II	.	.	III	.	.	.	.	.	.	.	.	.
D.S. Subass. ***C. a.-B. p. typicum***																		
Crepis sibirica	-hl	V	I	III	IV	+	V	IV	III	.	+	+	I	III	1	IV	V	III
Euphorbia pilosa	-hl	.	I	I	III	+	.	.	II	.	.	.	.	.	.	.	.	.
Padus avium	-s1	II	II	II	III	II	III	I	II	.	.	.	.	+	.	r	.	.
D.S. Subass. ***C. a.-B. p. fragarietosum viridis***																		
Achillea millefolium	-hl	IV	V	III	II	IV	V	+	II	.	.	.	.	.	.	.	.	.
Fragaria viridis	-hl	III	I	IV	I	III²	V²	I	+	.	.	.	.	I	4	+	.	.
Campanula altaica	-hl	IV	III	II	I	III	.	.	+	.	.	.	.	.	.	.	.	.

Table IV — Suballiances *Vicio unijugae-Pinenion* and *Achyrophoro-Pinenion*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Mean altitude (m)		290	310	310	270	330	800	200	300	350	370	340	300	350	550	360	630	900
Mean cover of tree layer %		64	50	53	59	54	56	49	50	63	58	60	52	56	51	55	64	60
Mean cover of shrub layer (%)		1	10	9	4	6	33	1	5	4	8	1	4	2	4	3	9	5
Mean cover of herb layer (%)		80	67	69	78	67	82	92	70	42	69	45	68	72	74	72	73	74
Mean cover of moss layer (%)		0	4	0	+	1	7	0	13	2	2	+	+	+	0	1	+	3
Mean heigt of tree layer (m)		19	20	20	19	22	24	22	22	20	21	21	19	20	18	22	23	23
Mean heigh of shrub layer (cm)		46	52	50	94	53	88	87	73	62	64	48	46	43	49	62	55	58
Mean height of herb layer (cm)		43	38	41	68	64	71	82	48	37	34	36	42	47	45	52	51	50
Mean nr. of specie in one relevé		71	62	55	58	55	67	48	63	38	46	42	53	55	54	54	57	51
Relevé area (m^2)		200	200	650	200	200	200	200	650	400	400	400	200	200	200	200	400	200
Number of species		122	170	153	209	189	111	118	163	74	141	79	82	193	84	228	102	121
Number of relevés		9	5	11	23	15	6	11	10	6	12	10	6	17	4	56	7	9
The main species of tree layer																		
Betula pendula	-t1	V⁴	V²	V⁴	V⁴	V⁴	V²	V⁴	V	III	V	V	V²	V²	4⁴	V²	.	.
Pinus sylvestris	-t1	.	V³	II⁴	I³	II⁴	V⁴	V²	V⁴	V⁴	V⁴	V⁴	V⁴	V⁴	4²	V⁴	V³	V³
Populus tremula	-t1	I	.	II	II²	.	V	I	+	I	II	I	II	I	.	II²	III	IV²
Larix sibirica	-t1	.	III	+	.	.	.	.	IV	II	III	V²	I	II²	.	IV²	.	I³
D.S. Ass. ***Artemisio latifoliae-Betuletum pendulae***																		
Galium verum	-hl	V	IV	V	II	II	II	.	.	.	.	.	.	III	3	.	.	.
Peucedanum morisonii	-hl	V	III	V	+	+	III	.	.	.	.	.	.	.	.	.	.	.
Artemisia latifolia	-hl	IV	V	V	+	II	.	.	II	.	.	.	.	II	.	+	.	.
Artemisia macrantha	-hl	IV	IV	V	+	.	I	.	II	.	.	.	.	I	.	.	.	.
Veratrum nigrum	-hl	IV	II	V	II	II	V	.	+	.	+	+	.	II	3	+	.	.
Silene nutans	-hl	IV	V	I	+	+	.	+	II	.	I	.	IV	III	2	+	.	.
Primula cortusoides	-hl	IV	IV	II	+	I	.	.	II	.	.	.	.	.	.	.	.	.
Calamagrostis epigeios	-hl	III	III	I	I	I	V²	II	+	.	I	.	.	III	.	I	I	.
D.S. Subass. ***A.l.-B.p. ligularietosum glaucae***																		
Galatella biflora	-hl	V	.	.	.	+	V	.	.	.	.	.	.	.	.	.	.	.
Ligularia glauca	-hl	V	I	I	+	+	II	.	.	.	.	.	.	.	.	.	.	.
Trisetum sibiricum	-hl	V	.	II	+	.	.	.	.	.	.	.	I	+	1	+	III	II
Poa urssulensis	-hl	IV	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia vulgaris	-hl	IV	I	.	II	I	II	III	.	.	.	.	.	II	.	+	.	III
Festuca rubra	-hl	IV	.	+	.	I	.	+	.	.	.	.	.	.	.	.	.	.
Pimpinella saxifraga	-hl	IV	I	.	I	I	.	+	.	.	.	.	.	+	.	.	.	.
D.S. Subass. ***A.l.-B.p. pinetosum sylvestris***																		
Orthilia secunda	-hl	I	IV	.	I	I	.	.	V	III	IV	II	V	I	.	II	II	I
Sorbus sibirica	-s1	.	III	+	II	II	.	.	V	.	II	.	.	.	.	+	.	.
Thalictrum foetidum	-hl	.	III	I	+	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S Ass. ***Calamagrostio arundinaceae-Betuletum*** = D.S. Suball. ***Vicio unijugae-Pinenion sylvestris***																		
Geranium bifolium	-hl	V	V	V	IV	IV	.	I	V	.	.	.	.	.	.	.	.	.
Ranunculus polyanthemos	-hl	V	II	III	V	IV	IV	III	II	.	.	.	II	II	1	+	.	.
Viola hirta	-hl	V	III	III	V	IV	V	IV	+	.	.	.	.	I	2	+	.	.
Seseli libanotis	-hl	IV	IV	IV	II	III	III	I	II	.	.	.	.	II	.	.	.	.
Origanum vulgare	-hl	V	IV	II	IV	III	V	IV	.	.	.	.	.	III	.	+	.	.
Vicia tenuifolia	-hl	IV	IV	.	II	I	V	.	II	.	.	.	.	+	.	.	.	.
Rosa majalis	-s1	IV	IV	IV	II	IV	I	I	III	.	II	.	I	+	.	+	.	.
Poa angustifolia	-hl	IV	IV	IV	IV	IV	II	II	+	.	.	.	.	I	.	.	.	.
Filipendula vulgaris	-hl	V	IV	V	II	V	III	.	.	.	.	.	.	.	.	.	.	.
Adenophora liliifolia	-hl	V	II	III	II	I	III	.	+	.	.	.	.	.	.	.	.	.
Polygonatum humile	-hl	IV	III	.	II	II	.	.	III	.	.	.	.	.	.	.	.	.
D.S. Subass. ***C. a.-B. p. typicum***																		
Crepis sibirica	-hl	V	I	III	IV	+	V	IV	III	.	+	+	I	III	1	IV	V	III
Euphorbia pilosa	-hl	.	I	I	III	+	.	.	II	.	.	.	.	.	.	.	.	.
Padus avium	-s1	II	II	II	III	II	III	I	II	.	.	.	.	+	.	r	.	.
D.S. Subass. ***C. a.-B. p. fragarietosum viridis***																		
Achillea millefolium	-hl	IV	V	III	II	IV	V	+	II	.	.	.	.	.	.	.	.	.
Fragaria viridis	-hl	III	I	IV	I	III²	V²	I	+	.	.	.	.	I	4	+	.	.
Campanula altaica	-hl	IV	III	II	I	III	.	.	+	.	.	.	.	.	.	.	.	.

Table IV — Suballiances *Vicio unijugae-Pinenion* and *Achyrophoro-Pinenion*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Mean altitude (m)		290	310	310	270	330	800	200	300	350	370	340	300	350	550	360	630	900
Mean cover of tree layer %		64	50	53	59	54	56	49	50	63	58	60	52	56	51	55	64	60
Mean cover of shrub layer (%)		1	10	9	4	6	33	1	5	4	8	1	4	2	4	3	9	5
Mean cover of herb layer (%)		80	67	69	78	67	82	92	70	42	69	45	68	72	74	72	73	74
Mean cover of moss layer (%)		0	4	0	+	1	7	0	13	2	2	+	+	+	0	1	+	3
Mean heigt of tree layer (m)		19	20	20	19	22	24	22	22	20	21	21	19	20	18	22	23	23
Mean heigh of shrub layer (cm)		46	52	50	94	53	88	87	73	62	64	48	46	43	49	62	55	58
Mean height of herb layer (cm)		43	38	41	68	64	71	82	48	37	34	36	42	47	45	52	51	50
Mean nr. of specie in one relevé		71	62	55	58	55	67	48	63	38	46	42	53	55	54	54	57	51
Relevé area (m^2)		200	200	650	200	200	200	200	650	400	400	400	200	200	200	200	400	200
Number of species		122	170	153	209	189	111	118	163	74	141	79	82	193	84	228	102	121
Number of relevés		9	5	11	23	15	6	11	10	6	12	10	6	17	4	56	7	9
The main species of tree layer																		
Betula pendula	-t1	V⁴	V²	V⁴	V⁴	V⁴	V²	V⁴	V	III	V	V	V²	V²	4⁴	V²	.	.
Pinus sylvestris	-t1	.	V³	II⁴	I³	II⁴	V⁴	V²	V⁴	V⁴	V⁴	V⁴	V⁴	V⁴	4²	V⁴	V³	V³
Populus tremula	-t1	I	.	II	II²	.	V	I	+	I	II	I	II	I	.	II²	III	IV²
Larix sibirica	-t1	.	III	+	.	.	.	.	IV	II	III	V²	I	II²	.	IV²	.	I³
D.S. Ass. ***Artemisio latifoliae-Betuletum pendulae***																		
Galium verum	-hl	V	IV	V	II	II	II	.	.	.	.	.	.	III	3	.	.	.
Peucedanum morisonii	-hl	V	III	V	+	+	III	.	.	.	.	.	.	.	.	.	.	.
Artemisia latifolia	-hl	IV	V	V	+	II	.	.	II	.	.	.	.	II	.	+	.	.
Artemisia macrantha	-hl	IV	IV	V	+	.	I	.	II	.	.	.	.	I	.	.	.	.
Veratrum nigrum	-hl	IV	II	V	II	II	V	.	+	.	+	+	.	II	3	+	.	.
Silene nutans	-hl	IV	V	I	+	+	.	+	II	.	I	.	IV	III	2	+	.	.
Primula cortusoides	-hl	IV	IV	II	+	I	.	.	II	.	.	.	.	.	.	.	.	.
Calamagrostis epigeios	-hl	III	III	I	I	I	V²	II	+	.	I	.	.	III	.	I	I	.
D.S. Subass. ***A.l.-B.p. ligularietosum glaucae***																		
Galatella biflora	-hl	V	.	.	.	+	V	.	.	.	.	.	.	.	.	.	.	.
Ligularia glauca	-hl	V	I	I	+	+	II	.	.	.	.	.	.	.	.	.	.	.
Trisetum sibiricum	-hl	V	.	II	+	.	.	.	.	.	.	.	I	+	1	+	III	II
Poa urssulensis	-hl	IV	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia vulgaris	-hl	IV	I	.	II	I	II	III	.	.	.	.	.	II	.	+	.	III
Festuca rubra	-hl	IV	.	+	.	I	.	+	.	.	.	.	.	.	.	.	.	.
Pimpinella saxifraga	-hl	IV	I	.	I	I	.	+	.	.	.	.	.	+	.	.	.	.
D.S. Subass. ***A.l.-B.p. pinetosum sylvestris***																		
Orthilia secunda	-hl	I	IV	.	I	I	.	.	V	III	IV	II	V	I	.	II	II	I
Sorbus sibirica	-s1	.	III	+	II	II	.	.	V	.	II	.	.	.	.	+	.	.
Thalictrum foetidum	-hl	.	III	I	+	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S Ass. ***Calamagrostio arundinaceae-Betuletum*** = D.S. Suball. ***Vicio unijugae-Pinenion sylvestris***																		
Geranium bifolium	-hl	V	V	V	IV	IV	.	I	V	.	.	.	.	.	.	.	.	.
Ranunculus polyanthemos	-hl	V	II	III	V	IV	IV	III	II	.	.	.	II	II	1	+	.	.
Viola hirta	-hl	V	III	III	V	IV	V	IV	+	.	.	.	.	I	2	+	.	.
Seseli libanotis	-hl	IV	IV	IV	II	III	III	I	II	.	.	.	.	II	.	.	.	.
Origanum vulgare	-hl	V	IV	II	IV	III	V	IV	.	.	.	.	.	III	.	+	.	.
Vicia tenuifolia	-hl	IV	IV	.	II	I	V	.	II	.	.	.	.	+	.	.	.	.
Rosa majalis	-s1	IV	IV	IV	II	IV	I	I	III	.	II	.	I	+	.	+	.	.
Poa angustifolia	-hl	IV	IV	IV	IV	IV	II	II	+	.	.	.	.	I	.	.	.	.
Filipendula vulgaris	-hl	V	IV	V	II	V	III	.	.	.	.	.	.	.	.	.	.	.
Adenophora liliifolia	-hl	V	II	III	II	I	III	.	+	.	.	.	.	.	.	.	.	.
Polygonatum humile	-hl	IV	III	.	II	II	.	.	III	.	.	.	.	.	.	.	.	.
D.S. Subass. ***C. a.-B. p. typicum***																		
Crepis sibirica	-hl	V	I	III	IV	+	V	IV	III	.	+	+	I	III	1	IV	V	III
Euphorbia pilosa	-hl	.	I	I	III	+	.	.	II	.	.	.	.	.	.	.	.	.
Padus avium	-s1	II	II	II	III	II	III	I	II	.	.	.	.	+	.	r	.	.
D.S. Subass. ***C. a.-B. p. fragarietosum viridis***																		
Achillea millefolium	-hl	IV	V	III	II	IV	V	+	II	.	.	.	.	.	.	.	.	.
Fragaria viridis	-hl	III	I	IV	I	III²	V²	I	+	.	.	.	.	I	4	+	.	.
Campanula altaica	-hl	IV	III	II	I	III	.	.	+	.	.	.	.	.	.	.	.	.

Table IV (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
D.S. Ass. ***Roso spinosissimae-Pinetum sylvestris***																		
Potentilla chrysantha	-hl	.	I	+	+	II	V^2	.	.	.	.	.	.	+	.	.	.	.
Artemisia sericea	-hl	.	.	+	.	.	V^2	.	.	.	.	.	.	.	.	.	.	.
Cirsium serratuloides	-hl	.	II	+	+	.	V	.	.	.	.	.	.	.	.	+	.	.
Rosa pimpinellifolia	-s1	.	.	.	.	.	V^3	.	.	.	.	.	.	.	.	.	.	.
Dictamnus albus	-hl	.	.	.	.	.	V	.	.	.	.	.	.	.	.	.	.	.
Galatella angustissima	-hl	.	.	.	.	.	V	.	.	.	.	.	.	.	.	.	.	.
Aconogonon alpinum	-hl	.	.	.	+	+	V	.	.	.	.	.	.	.	1	+	.	I
Moehringia lateriflora	-hl	.	.	.	+	I	IV	+	+	.	.	.	.	.	1	.	IV	I
Hieracium virosum	-hl	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	r	.	.
Lonicera tatarica	-s1	.	.	+	+	I	IV	.	.	.	.	.	.	.	.	.	.	.
Adonis sibirica	-hl	.	.	+	+	+	IV	.	I	.	.	.	.	.	3	.	.	.
Aulacospermum anomalum	-hl	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.
Veronica spuria	-hl	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.
Daphne altaica	-s1	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.
Clematis integrifolia	-hl	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Astragalo glycyphylli-Pinetum sylvestris***																		
Astragalus glycyphyllos	-hl	.	.	.	II	I	.	V	.	.	.	.	.	.	.	.	.	.
Melilotoides platycarpos	-hl	III	I	.	II	+	I	V	I	.	.	.	.	+	.	+	.	.
Agrostis gigantea	-hl	.	.	.	+	II	.	V^2	.	.	.	.	.	.	.	.	.	.
Aegopodium podagraria	-hl	.	.	.	III^2	II^2	.	V^2	I	.	.	.	.	.	.	.	.	.
Lysimachia vulgaris	-hl	.	.	.	+	.	.	IV	.	.	.	.	.	.	.	.	.	.
Carex pallescens	-hl	.	.	.	I	+	.	III	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Cnidio dubii-Pinetum sylvestris***																		
Maianthemum bifolium	-hl	.	II	I	+	I	.	III	V	V	V	V	V^2	III	3	IV	V	V
Kadenia dubia	-hl	I	I	.	.	.	.	.	V	.	.	.	.	.	.	r	.	.
Vaccinium myrtillus	-hl	.	I	.	.	.	.	.	V	.	V^2	.	.	I	.	III	.	.
Platanthera bifolia	-hl	.	I	.	I	.	.	.	V	I	II	.	II	II	.	II	.	.
Dactylorhiza hebridens	-hl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Festuco ovinae-Pinetum sylvestris***																		
Ledum palustre	-hl	.	.	.	.	.	.	.	.	V^2	V	IV	.	.	.	+	.	I
Linnaea borealis	-hl	.	.	.	.	.	.	.	+	IV	II	V	.	.	.	.	.	I
Duschekia fruticosa	-s1	.	.	II	+	I	.	.	.	III	III^2	I	.	.	.	r	II	.
Anemonoides reflexa	-hl	.	.	.	.	.	.	.	.	III	III	V	.	.	.	I	I	I
Tephroseris integrifolia	-hl	I	III	+	.	I	.	.	.	V	.	III	.	II	1	+	.	.
Trientalis europaea	-hl	.	I	.	.	.	.	.	.	II	IV	III	.	.	.	I	V	III
Luzula pilosa	-hl	.	I	.	.	.	.	+	II	.	IV	IV	I	+	.	III	.	.
Vaccinium uliginosum	-hl	.	.	.	.	.	.	.	.	II	III	II	.	.	.	+	.	.
Polytrichum strictum	-ml	.	.	.	.	.	.	.	.	III	III	I	.	I	.	I	.	.
D.S. Subass ***F. o.-P. s. rhododendretosum davurici***																		
Carex media	-hl	.	.	.	.	.	.	.	.	V	.	.	.	.	.	.	.	.
Pedicularis labradorica	-hl	.	.	.	.	.	.	.	.	V	I	I	.	.	.	.	.	II
Viola canina	-hl	V	.	.	II	I	.	.	.	V	+	.	.	.	.	+	.	.
Rhododendron davuricum	-s1	.	.	.	.	.	.	.	.	V^2	.	.	.	.	.	.	V^2	III^2
Equisetum scirpoides	-ml	.	.	.	.	.	.	.	.	V	I	.	.	.	.	+	.	I
Valeriana alternifolia	-hl	.	.	.	.	.	.	.	.	IV	I	.	.	I	.	r	.	II
Pyrola chlorantha	-hl	.	.	.	+	.	.	.	II	III	+	+	I	I	.	I	II	I
Campanula rotundifolia	-hl	.	I	.	.	.	.	.	+	III	.	.	.	.	.	.	.	.
D.S. Subass. ***F. o.-P. s. vaccinietosum myrtilli***																		
Pyrola rotundifolia	-hl	.	I	.	I	+	.	.	II	.	III	+	.	I	.	I	V^2	IV
Solidago dahurica	-hl	.	V	.	.	.	.	.	V	.	III	.	.	I	.	+	II	V
Viola arenaria	-hl	III	V	I	+	+	I	.	IV	.	III	.	II	I	4	I	III	.
Vicia multicaulis	-hl	.	.	.	.	.	.	.	.	.	III	.	.	I	.	+	.	.
Gymnocarpium dryopteris	-hl	.	.	.	.	.	.	.	II	.	III	.	.	.	.	+	.	I
Polygala comosa	-hl	.	I	+	.	.	.	.	+	I	III	+	.	III	.	II	.	.
D.S. Subass. ***F. o.-P. s. typicum***																		
Vicia venosa inc. *V. baicalensis*-hl		.	.	.	.	.	.	.	.	I	+	V	.	.	.	I	V	IV^2
Picea obovata	-s1	.	.	.	+	.	.	.	.	.	.	III	.	.	.	+	.	.
Polytrichum commune	-ml	.	.	.	.	.	.	.	.	I	.	III	.	.	.	.	.	.
Ranunculus propinquus	-hl	.	.	.	+	I	.	.	.	.	.	III	.	II	1	II	III	.

Table IV (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
D.S. Ass. ***Crepido praemorsae-Pinetum sylvestris***=D.S. Subass. ***Crepido praemorsae-Pinetum sylvestris typicum***																		
Aconitum barbatum	-hl	III	V	V	II	III	.	.	III	.	+	.	V	IV	3	II	III	III^2
Artemisia tanacetifolia	-hl	.	.	.	.	.	.	.	.	.	.	.	V	+	4	+	II	.
Astragalus propinquus	-hl	.	.	.	.	.	.	.	.	.	.	.	IV	I	4	+	.	.
Crepis praemorsa	-hl	II	I	I	+	II	.	II	II	.	+	.	V	III	3	II	III	II
Adenophora lamarckii	-hl	.	.	.	.	.	.	.	.	.	+	.	V	II	2	I	.	.
Scorzonera radiata	-hl	.	.	.	.	.	I	.	.	.	.	.	V	III	2	II	III	.
Polygonatum odoratum	-hl	V	.	V	IV	IV	I	IV	III	.	.	.	V	IV	4	+	.	II
Allium strictum	-hl	.	.	+	.	.	.	.	.	.	.	.	II	II	2	+	.	.
Phlomoides tuberosa	-hl	IV	III	V	V	V	V	.	II	.	.	.	.	IV	3	I	.	III
Variant ***Hemerocallis minor***																		
Hemerocallis minor	-hl	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	+	.	II
D.S. Subass. ***C. p.-P. s. asteretosum tatarici***																		
Heteropappus biennis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
Aster tataricus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
Zigadenus sibiricus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
Carex amgunensis	-hl	.	.	.	.	.	.	.	.	.	.	.	I	.	3	.	V^2	.
Vicia amoena	-hl	.	.	.	+	.	.	+	.	.	.	.	.	I	3	+	IV	.
Potentilla fragarioides	-hl	II	.	+	II	II	.	.	.	.	.	.	.	.	2	.	III	I
Gentiana macrophylla	-hl	.	.	.	.	.	.	.	.	.	.	.	.	+	2	.	.	III
Elymus ircutensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.
D.S. Ass. ***Thesio repentis-Pinetum sylvestris***																		
Vicia sylvatica	-hl	III	I	.	II	I	.	IV	IV	.	II	.	I	+	.	IV	.	.
Lathyrus vernus	-hl	V	II	II	IV^2	III^2	.	IV	V	.	II	.	.	II	.	V^2	.	.
Pedicularis resupinata	-hl	.	.	.	.	.	.	.	.	.	II	.	.	I	.	IV	II	.
Geranium sylvaticum	-hl	V	III	II	IV	III	.	III	IV	.	+	.	I	II	.	III	.	.
Lathyrus gmelinii	-hl	IV	.	I^2	III	+	.	II	IV	.	.	.	.	+	.	III	.	.
Parnassia palustris	-hl	.	.	.	.	.	.	.	.	.	I	.	.	+	.	III	.	.
Dactylorhiza maculata	-hl	I	.	.	+	+	.	.	.	.	I	.	.	I	.	III	.	II
D.S. Ass. ***Geranio vlassowiani-Pinetum sylvestris***																		
Betula platyphylla	-t1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V^4	V^3
Geranium vlassowianum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	IV
Ranunculus japonicus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	V
Lilium pensylvanicum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	II
D.S. Subass. ***G. v.-P. s. geranietosum eriostemonis***																		
Geranium eriostemon	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	V	.
Viola sacchalinensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.
Malaxis monophyllos	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.
Iris uniflora	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.
Equisetum hyemale	-hl	.	.	.	.	+	.	.	.	II	I	.	I	I	.	r	III	.
Allium splendens	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	I
Hieracium ganeschinii	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.
Larix gmelinii	-t1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.
D.S. Subass. ***G. v.-P. s. polemonietosum chinensis***																		
Fragaria orientalis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	V^2
Poa sibirica	-hl	.	.	II	I	.	II	.	.	.	.	.	I	II	2	II	II	V
Polemonium chinense	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV
Tragopogon orientalis	-hl	I	.	.	.	.	.	.	.	.	.	.	.	I	.	+	.	III
Calamagrostis korotkyi	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III^2
Carex pediformis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III^2
D.S. Suball. ***Achyrophoro-Pinenion sylvestris***																		
Pulsatilla patens	-hl	I	V	II	+	+	V	.	V	V	III	V	V^2	V	4^2	IV	II	III^2
Antennaria dioica	-hl	.	IV	.	.	+	.	.	II	V	V	II	IV	III	.	III	.	II
Trommsdorfia maculata	-hl	II	III	II	+	II	III	I	III	.	V	II	V	IV	4	V	V	.
Vaccinium vitis-idaea	-hl	.	.	.	.	+	.	.	V	V^2	V^2	V^2	V	II	.	IV^2	V	III^2

Table IV (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Cypripedium guttatum	-hl	.	I	.	.	.	.	.	I	V	IV	I	V	III	.	IV	V	IV
Pyrola incarnata	-hl	.	.	.	+	.	.	.	.	V	II	IV	V	+	1	+	V	I
Festuca ovina	-hl	.	.	.	.	.	.	.	.	V	.	IV	V	.	3	.	I	III
Anemonastrum crinitum	-hl	.	.	.	.	.	.	.	.	.	+	III	V^2	.	4	+	.	V
Dendranthema zawadskii	-hl	.	.	.	.	.	.	.	.	III	I	.	IV	I	2	+	III	II
Thesium repens	-hl	.	.	.	.	.	.	.	.	I	III	I	.	II	2	II	II	I
D.S. All. ***Vicio unijugae-Pinion sylvestris***																		
Inula salicina	-hl	V	IV	IV	V	III	.	V	III	.	+	.	V	V	.	V	I	III
Lupinaster pentaphyllus	-hl	V	V	V	IV	IV	V	V	V	.	III	V	V	V	3	V	V	V
Vicia unijuga	-hl	V	IV	V	V	IV^2	.	V	V	I	+	.	V	V	3^2	IV^2	V^2	III^2
Lathyrus pisiformis	-hl	V	IV	III	IV	IV	V	IV	IV	.	.	.	.	III	.	I	.	.
Aquilegia sibirica	-hl	.	.	.	.	.	.	.	.	II	V	V	V	III	3	III	III	II
Ptarmica impatiens	-hl	V	III	II	III	.	.	II	I	.	I	II	II	III	.	III	.	.
Geranium pseudosibiricum	-hl	.	.	I	.	.	III	.	.	III	V	V	V^2	V	4^2	IV	V	III
Saussurea controversa	-hl	.	II	I	+	.	.	.	.	I	II	II	V^2	V	1	IV	.	.
D.S. All. ***Lathyro gmelinii-Pinion sylvestris***																		
Aconitum septentrionale	-hl	I	.	.	II	I	I	II	II	.	+	+	.	.	.	+	.	I
Milium effusum	-hl	.	.	.	+	+	.	.	I	.	II	.	.	.	.	+	.	.
Cirsium heterophyllum	-hl	.	.	.	+	.	.	II	.	.	.	.	.	.	.	+	.	.
Stellaria bungeana	-hl	.	.	.	+	.	.	.	.	.	+	.	.	.	.	r	.	.
Athyrium filix-femina	-hl	.	.	.	+	I	.	.	I	.	.	.	.	.	.	.	.	.
D.S. Ord. ***Carici macrourae-Pinetalia sylvestris***																		
Carex macroura	-hl	.	V^2	V^2	V^2	V^2	V^2	V^2	V^2	I	II^2	V	V^2	V^2	4^2	V^2	V^2	V^2
Bupleurum aureum	-hl	IV	V	III	V	I	V^2	V	V	.	+	.	.	II	2	III	.	.
Pteridium aquilinum	-hl	IV	I	II	III^2	II^2	.	IV^2	II	.	II	.	II	III^2	.	IV^2	IV^2	II^2
Trollius asiaticus	-hl	IV	II	II	III	II	II	III	IV	II	III	V	V	III	.	V	V	V
Heracleum dissectum	-hl	IV	II	I	IV	+	IV	III	III	.	.	.	III	III	1	III	III	IV
Viola uniflora	-hl	.	V	III^2	IV^2	III	.	+	IV	V	IV	V	I	III	.	IV	V	IV
Cimicifuga foetida	-hl	.	I	II	II	I	.	.	.	IV	+	.	II	III	2	II	.	I
Aconitum volubile	-hl	III	.	III	III	II	I	.	II	.	+	.	III	I	.	I	.	.
D.S. Cl. ***Brachypodio pinnati-Betuletea pendulae***																		
Brachypodium pinnatum	-hl	V^2	V	IV^2	V^2	IV^2	V^2	V^2	V^2	.	III^2	.	V^2	V^2	4	V^2	V^2	III
Pulmonaria mollis	-hl	V	IV	V	V	V	V	V	V	.	III	V	V	IV	2	V	V	V
Rubus saxatilis	-hl	V^2	V	V^2	V^2	V^2	V^2	IV	V	V	V^2	V	V^2	V^2	4^2	V^2	V^2	V
Lilium pilosiusculum	-hl	V	V	IV	V	III	V	II	V	.	III	III	II	IV	4	III	IV	IV
Pleurospermum uralense	-hl	V	III	V	IV	II	III	II	V	II	III	IV	V	III	2	IV	V	III
Calamagrostis arundinacea	-hl	V^2	IV	IV^2	V^2	IV	.	V	V^2	V^2	V^2	V^2	V^2	V^2	4^2	V^2	V^2	.
Iris ruthenica	-hl	V	IV	IV^2	IV^2	IV^2	V^2	+	V	V	V^2	V^2	V^2	V^2	4^2	V^2	V	V^2
Hieracium umbellatum	-hl	III	IV	III	III	I	V	I	V	V	V	V	V	IV	2	V	V	III
Angelica sylvestris	-hl	IV	II	+	IV	.	III	V	IV	.	IV	II	I	III	.	V	II	II
Serratula coronata	-hl	IV	III	II	IV	II	V	+	II	.	I	.	.	III	2	II	.	.
Agrimonia pilosa	-hl	IV	II	V	V	V	.	V	.	.	.	.	.	.	2	+	.	II
Vicia sepium	-hl	V	IV	II	IV	III	I	IV	IV	.	+	.	I	III	1	V	I	.
D.S. Cl. ***Querco-Fagetea***																		
Melica nutans	-hl	.	IV	I	II	III	.	III^2	IV	.	II	+	IV	+	1	IV	V	III
Viola mirabilis	-hl	V	V	V	III	III	.	.	III	III	I	.	IV	I	4	+	.	.
Poa nemoralis	-hl	.	I	+	+	+	III	II	+	.	.	.	.	.	.	.	.	.
Epipactis helleborine	-hl	.	.	.	+	.	.	.	.	.	+	.	.	.	.	II	.	.
Viburnum opulus	-sl	.	.	.	I	+	.	.	+	.	.	.	.	.	.	.	.	.
Daphne mezereum	-hl	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Scrophularia nodosa	-hl	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.
Festuca gigantea	-hl	.	.	.	I	+	.	.	.	.	.	.	.	.	.	.	.	.
Adoxa moschatellina	-hl	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.
D.S. Cl. ***Vaccinio-Piceetea***																		
Pleurozium schreberi	-ml	.	III^2	.	.	.	V^2	.	III^2	IV	III	III	.	+	.	II	.	II
Poa pratensis	-hl	.	.	.	.	.	.	.	+	.	.	.	.	III	.	I	.	.
Goodyera repens	-hl	.	.	.	.	.	.	.	I	II	.	.	.	.	.	+	.	.
Pyrola media	-hl	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Pyrola minor	-hl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	r	.	.
Moneses uniflora	-hl	.	I	.	.	.	.	.	I	I	+	II	.	.	.	r	.	.

Table IV (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Dicranum polysetum	-ml	.	.	.	.	.	.	.	.	II	I	.	.	+	.	I	.	.
Lonicera altaica	-s1	.	.	.	.	.	.	.	.	I	II	II	.	.	.	+	.	.
D.S. Cl. ***Rhytidio-Laricetea***																		
Aster alpinus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Rhytidium rugosum	-ml	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
D.S. Cl. ***Molinio-Arrhenatheretea***																		
Sanguisorba officinalis	-hl	V	IV	V	V	V	.	III	V	.	III	II	V	V	3	V	V	V
Galium boreale	-hl	V^2	V	V	V	V	V	V	V	I	V	V	V	V	3	V	V	V
Lathyrus pratensis	-hl	IV	I	I	III	IV	V	IV	.	.	I	+	III	III	.	III	.	.
Trifolium pratense	-hl	II	I	III	III	III	.	IV	+	.	.	.	IV	II	1	I	.	.
Dactylis glomerata	-hl	V^2	IV	II	V^2	IV^2	V^2	V^2	III	.	.	.	.	.	.	+	.	.
Vicia cracca	-hl	II	I	III	III	III	.	.	.	I	+	V	IV	III	3	III	.	III
Elytrigia repens	-hl	I	I	I	III	II	.	I	.	.	.	.	.	.	.	.	.	.
Prunella vulgaris	-hl	.	I	.	I	II	.	III	+	.	.	.	.	.	.	+	.	.
Phleum pratense	-hl	.	I	.	II	I	.	I^2	.	.	.	.	.	+	.	+	.	.
Amoria repens	-hl	.	II	+	I	+	.	III	II	.	.	.	.	.	.	I	I	.
Stellaria graminea	-hl	IV	I	II	II	II	.	+	I	.	.	.	.	.	.	+	I	.
Leucanthemum vulgare	-hl	I	I	.	I	I	.	III	.	.	.	.	.	II	.	+	.	.
Festuca pratensis	-hl	.	.	+	II	II	.	II^2	.	.	.	.	.	I	.	.	.	.
Geranium pratense	-hl	I	.	+	I	II	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus repens	-hl	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Other species:																		
Thalictrum minus	-hl	V	IV	IV	V	IV	V	IV	IV	II	I	V	V	IV	4	IV	IV^2	V
Lathyrus humilis	-hl	II	IV	V	II	III	V^2	.	V	IV	V	V^2	V	IV	4	V^2	V^2	V^2
Fragaria vesca	-hl	V	III	II^2	IV	IV^2	.	III	V	.	+	+	V	I	.	I	.	.
Dracocephalum ruyschiana	-hl	IV	III	IV	+	II	V	.	II	I	I	III	V	IV	3	+	III	III
Rosa acicularis	-s1	II	II	III^2	II	I	V^2	.	II	V	IV	V	V	IV	4	V	V	V
Chamaenerion angustifolium	-hl	II	III	.	II	.	IV	+	III	I	IV	IV	.	II	.	III	I	IV
Euphorbia discolor	-hl	V	V	I	II	II	V	.	V	.	+	.	.	I	3	+	III	.
Equisetum pratense	-hl	IV	.	.	I	.	.	V	.	V	III	I	V	II	.	II	V	V
Spiraea media	-s1	.	IV^2	IV^2	I	I	III	.	V	I	II	III	V	I	2	I	IV	IV
Filipendula ulmaria	-hl	IV	V	V	III	III	.	III	+	.	.	.	.	II	.	+	.	.
Campanula glomerata	-hl	IV	II	III	II	I	.	+	I	.	I	I	V	III	.	III	III	II
Solidago virgaurea	-hl	IV	.	V	III	II	V	III	.	I	.	I	.	.	4	r	.	.
Helictotrichon pubescens	-hl	III	III	II	I	II	II	II	III	.	.	.	I	III	1	+	.	II
Cotoneaster melanocarpus	-s1	.	IV	II	+	I	IV	.	+	.	.	.	.	I	.	.	.	.
Caragana arborescens	-s1	I	II	III^2	+	+	V^2	.	V^2	.	.	.	.	.	.	.	.	.
Betula pendula	-s1	III	I	I	III	.	.	I	II	.	III	III	.	II	1	.	.	.
Silene repens	-hl	.	.	+	.	+	IV	.	.	I	.	.	.	I	2	+	III	.
Phleum phleoides	-hl	.	I	+	+	+	I	IV	.	.	.	.	.	I	.	.	.	.
Viola montana	-hl	.	I	.	II	III	I	IV	III	.	.	.	.	I	.	I	.	.
Achillea asiatica	-hl	.	.	.	+	.	.	.	.	.	+	II	V	IV	4	III	.	III
Centaurea scabiosa	-hl	III	I	+	II	+	.	.	.	.	.	.	.	I	.	+	.	.
Ranunculus monophyllus	-hl	III	.	I	II	II	I	+	.	.	.	.	.	.	.	+	.	.
Pinus sylvestris	-s1	.	.	II	.	.	III	II	III	IV	IV	III	III	II	3	II	.	II
Dianthus superbus	-hl	.	IV	II	+	+	IV	.	I	I	I	I	II	II	.	+	II	II
Galatella macrosciadia	-hl	.	.	III	+	I	I	.	.	.	.	.	.	+	.	.	.	.
Hylotelephium triphyllum	-hl	II	I	III	II	II	II	+	.	.	.	.	.	.	.	.	.	.
Geum aleppicum	-hl	II	I	II	III	III	.	II	.	.	.	.	.	+	.	r	I	.
Crataegus sanguinea	-s1	.	II	II	II	III	.	.	.	.	.	.	.	.	.	.	.	.
Populus tremula	-s1	.	.	.	.	.	III	.	.	.	.	.	.	.	.	II	III	III
Rubus idaeus	-s1	.	.	.	+	.	III	.	.	.	+	.	.	.	.	+	II	.
Elymus mutabilis	-hl	.	.	.	+	.	III	.	.	.	.	.	.	.	.	.	.	.
Oberna behen	-hl	.	.	+	+	I	III	+	.	.	.	.	.	.	.	.	.	.
Vicia megalotropis	-hl	.	.	II	+	+	.	III	II	.	+	.	.	I	.	I	.	I
Aegopodium alpestre	-hl	.	.	.	.	.	.	.	.	III	II	+	.	.	.	II	II	III
Cypripedium macranthon	-hl	.	.	.	+	.	.	.	.	.	+	.	.	III	.	II	.	III
Salix caprea	-s1	.	I	.	I	I	.	+	II	.	II	II	.	I	.	III	III	III
Plantago urvillei	-hl	II	.	I	+	+	.	.	.	.	.	.	.	.	1	.	.	.
Filipendula stepposa	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.
Bistorta major	-hl	II	.	+	I	.	.	.	.	I	.	.	.	+	.	+	.	II
Carex praecox	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table IV (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Bromopsis inermis	-hl	II	I	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.
Taraxacum officinale	-hl	II	I	II	II	II	.	II	I	.	.	.	.	.	.	r	.	.
Veronica spicata	-hl	.	II	+	.	.	.	.	II	.	.	.	.	.	.	.	.	.
Veronica krylovii	-hl	I	II	I	+	I	.	.	.	.	.	.	.	+	1	.	.	.
Androsace amurensis	-hl	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Thalictrum simplex	-hl	.	II	II	II	II	.	II	.	.	+	.	.	I	.	+	.	.
Bupleurum multinerve	-hl	.	II	I	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Poa palustris	-hl	.	II	.	.	.	.	.	II	.	.	.	.	I	.	+	.	.
Chimaphila umbellata	-hl	.	II	.	+	.	.	.	I	.	.	.	.	I	.	.	.	.
Anthriscus sylvestris	-hl	I	I	.	II	I	I	.	.	.	.	.	.	.	.	+	.	.
Veronica chamaedrys	-hl	.	I	.	II	I	.	.	.	.	.	.	.	.	.	.	.	.
Cirsium setosum	-hl	I	I	+	II	I	.	.	+	.	.	.	.	.	.	.	.	.
Hypericum perforatum	-hl	.	.	.	+	II	II	.	.	.	.	.	.	.	.	.	.	.
Lithospermum officinale	-hl	.	.	+	.	II	.	.	.	.	.	.	.	.	.	.	.	.
Glechoma hederacea	-hl	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.
Cotoneaster uniflorus	-s1	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.
Lamium album	-hl	.	.	.	+	.	II	.	.	.	.	.	.	.	.	.	.	.
Melica altissima	-hl	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.
Helictotrichon schellianum	-hl	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.
Linaria vulgaris	-hl	.	.	.	+	.	II	.	.	.	.	.	.	I	.	.	.	.
Phragmites australis	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Equisetum sylvaticum	-hl	I	.	.	+	.	.	II	.	.	+	.	.	+	.	II	.	.
Hypericum elegans	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Plantago media	-hl	.	I	.	+	+	.	II	.	.	.	.	I	+	.	+	.	.
Pedicularis incarnata	-hl	.	.	+	.	.	.	II	.	.	.	.	.	I	.	II	.	.
Dryopteris carthusiana	-hl	.	.	.	.	+	.	.	II	.	.	.	.	.	.	.	.	.
Abies sibirica	-s1	.	.	.	+	I	.	.	II	.	+	.	.	.	.	.	.	.
Arctostaphylos uva-ursi	-hl	.	.	.	.	.	.	.	.	II	+	.	.	.	.	.	.	.
Atragene sibirica	-hl	.	I	.	.	.	.	.	.	I	II	+	.	+	.	I	.	I
Diphasiastrum complanatum	-hl	.	.	.	.	.	.	.	+	.	II	.	.	.	.	.	.	.
Pedicularis sibirica	-hl	.	I	.	.	.	.	.	.	.	.	.	.	II	.	+	.	.
Cypripedium calceolus	-hl	.	.	.	.	.	.	.	+	.	.	.	.	II	.	I	.	.
Cacalia hastata	-hl	.	I	.	I	.	.	I	.	.	.	.	.	I	.	II	I	II
Gentianella amarella	-hl	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.
Euphrasia parviflora	-hl	.	I	.	.	.	.	.	.	.	I	.	I	I	.	.	.	.
Calamagrostis obtusata	-hl	.	.	.	.	.	.	.	.	.	I	.	.	.	.	+	II	II
Saussurea parviflora	-hl	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	II	.
Salix abscondita	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Sedum aizoon	-hl	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	II
Bromopsis pumpelliana	-hl	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	II
Carex sabynensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Filipendula palmata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Saussurea stubendorffii	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Veronicastrum sibiricum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II

Table IV (continuation)

Species with few occurrences:

Achnatherum sibiricum (hl) - 14(I), *Aconitum ambiguum* (hl) - 15(+), *Actaea erythrocarpa* (hl) - 13(+), 15(+), *Adonis vernalis* (hl) - 5(I), *Agrostis clavata* (hl) - 15(+), *Allium microdictyon* (hl) - 15(+), 19(I), *A. nutans* (hl) - 2(I), 3(+), *Alopecurus pratensis* (hl) - 13(+), 15(r), *Anemone sylvestris* - 2(I), 3(I), 4(+), 5(+), 6(I), 12(1), 14(I), 15(+), 17(I), *Anemonoides altaica* (hl) - 10(I), 15(+), 18(I), *Arabis pendula* (hl) - 2(I), 4(+), 5(+), 13(+), *Artemisia gmelinii* (hl) - 5(+), 13(+), *A. integrifolia* (hl) - 7(I), 18(I), *Astragalus danicus* (hl) - 1(I), 2(I), 3(I), 4(+), 5(I), 7(+), 13(+), 18(I), *A. frigidus* (hl) - 13(I), *A. membranaceus* (hl) - 10(+), 15(r), 19(I), *Aulacomnium palustre* (ml) - 10(I), 15(r), *Berteroa incana* (hl) - 5(I), *Bistorta vivipara* (hl) - 13(+), 19(I), *Botrychium lunaria* (hl) – 15(r), *B. virginianum* (hl) – 15(r), *Bryum* sp. (ml) – 15(+), *Calamagrostis langsdorffii* (hl) - 8(+), 10(+), 15(+), *C. pavlovii* (hl) – 19(I), *Campanula bononiensis* (hl) - 5(+), *C. cervicaria* (hl) - 7(+), *Caragana frutex* (s1) - 6(I), *Carex arnellii* (hl) - 5(I), 18(I), *C. caryophyllea* (hl) - 1(I), *C. muricata* (hl) - 6(I), 18(I), *C. vaginata* (hl) – 15(+), *Carlina biebersteinii* (hl) - 13(I), 15(r), *Carum carvi* (hl) - 4(+), 5(+), *Cerastium arvense* (hl) - 2(I), *C. pauciflorum* (hl) - 15(r), *Ceratodon purpureus* (ml) - 13(I), *Chenopodium album* (hl) - 2(I), *Circaea alpina* (hl) - 8(+), 10(+), *Conioselinum tataricum* (hl) - 2(I), 6(I), 8(+), 15(+), *Corydalis bracteata* (hl) - 3(+), 4(+), *Crepis lyrata* (hl) - 4(+), 15(+), *Cruciata krylovii* (hl) - 5(I), *Cynoglossum officinale* (hl) - 5(+), *Dactylorhiza fuchsii* (hl) - 4(+), 13(I), *D. incarnata* (hl) - 10(+), 15(+), 18(I), *D. majalis* (hl) - 10(I), 13(+), 15(+), *Delphinium crassifolium* (hl) - 18(I), *D. elatum* (hl) - 15(I), *D. retropilosum* (hl) - 4(+), 5(I), *Deschampsia cespitosa* (hl) - 2(I), 8(+), *Dianthus versicolor* (hl) - 13(+), *Dicranum fuscescens* (ml) - 10(+), 19(I), *Draba nemorosa* (hl) - 2(I), *Dracocephalum nutans* (hl) - 2(I), 13(I), *Dryopteris expansa* (hl) - 2(I), *Elymus caninus* (hl) - 2(I), 3(+), 4(+), *E. gmelinii* (hl) - 3(+), *E. komarovii* (hl) - 5(+), *Epilobium montanum* (hl) - 5(+), 8(+), *Epipactis palustris* (hl) - 4(+), *Equisetum arvense* (hl) - 4(+), 13(+), *Erigeron acris* (hl) - 13(I), *Eryngium planum* (hl) - 5(+), 7(+), *Erysimum hieracifolium* (hl) - 3(+), *Erythronium sibiricum* (hl) - 8(+), *Festuca pseudovina* (hl) - 3(+), *Galatella dahurica* (hl) - 13(+), *G. hauptii* (hl) - 2(I), *Galium davuricum* (hl) - 19(I), *G. mollugo* (hl) - 2(I), 4(+), *G. uliginosum* (hl) - 4(+), 8(+), 15(+), *Gentianopsis barbata* (hl) - 14(I), 15(+), *Geranium transbaicalicum* (hl) - 9(I), *Geum rivale* (hl) - 8(+), *Gymnadenia conopsea* (hl) - 2(I), 3(+), 10(+), 13(I), 15(r), 19(I), *Gymnocarpium robertianum* (hl) - 15(r), *Hieracium x robustum* (hl) - 6(I), *Hierochloe odorata* (hl) - 3(+), *Humulus lupulus* (hl) - 6(I), *Hylocomium splendens* (ml) - 11(+), 13(+), 15(+), 18(I), *Hypericum hirsutum* (hl) - 4(+), 5(I), 6(I), 7(+), *Hypopitys monotropa* (hl) - 2(I), *Impatiens noli-tangere* (hl) - 4(+), 8(+), *Inula britannica* (hl) - 5(+), *Kitagawia baicalensis* (hl) – 13(+), *Knautia arvensis* (hl) - 1(I), *Koeleria cristata* (hl) - 2(I), *Ligularia sibirica* (hl) - 8(+), *Listera ovata* (hl) - 4(+), 8(+), 13(+), 15(+), *Lonicera xylosteum* (s1) - 8(+), *Luzula multiflora* (hl) - 7(+), 8(I), 13(I), 15(r), *L. parviflora* (hl) - 15(r), *Lycopodium annotinum* (hl) - 8(+), 10(+), *L. clavatum* (hl) - 10(I), *Medicago falcata* (hl) -3(+), 5(I), *Melampyrum pratense* (hl) – 10(I), 15(r), *M. album* (hl) - 4(+), 5(+), 10(+), 15(+), *Mitella nuda* (hl) - 9(I), *Mnium sp.* (ml) – 15(+), *Moehringia trinervia* (hl) - 8(+), *Myosotis cespitosa* (hl) – 2(I), *M. imitata* (hl) - 2(I), 5(I), 14(I), *Neottia nidus-avis* (hl) - 8(+), *Neottianthe cucullata* (hl) - 2(I), 8(+), 15(r), *Nepeta pannonica* (hl) - 5(I), 6(I), *Omalotheca sylvatica* (hl) - 2(I), *Onobrychis sibirica* (hl) - 13(+), *O. tanaitica* (hl) - 3(+), *Orchis militaris* (hl) - 10(+), 15(+), *Orobanche coerulescens* (hl) - 13(I), *Orostachys spinosa* (hl) - 13(+), *Oxalis acetosella* (hl) - 8(+), 10(+), 15(+), *Oxytropis campanulata* (hl) - 3(+), 13(+), *Paeonia anomala* (hl) - 2(I), 4(I), 13(+), 15(+), *Paris quadrifolia* (hl) - 9(I), 10(+), 11(+), 15(I), 19(I), *Pedicularis karoi* (hl) - 10(+), *Peucedanum vaginatum* (hl) - 15(+), *Picris hieracioides* (hl) – 4(+), 7(+), *Pinus sibirica* (s1) - 15(+), *Plantago major* (hl) - 4(+), 5(I), 7(I), 8(+), 15(+), *Poa supina* (hl) - 8(I), *P. transbaicalica* (hl) - 5(+), *P. trivialis* (hl) - 3(+), 4(+), 8(+), *Polemonium coeruleum* (hl) - 1(I), 3(+), 4(I), 5(I), 7(+), 8(+), 13(+), 15(I), *Polygala sibirica* (hl) - 13(+), 19(I), *Potentilla argentea* (hl) - 5(I), *P. humifusa* (hl) -2(I), 7(+), *P. multifida* (hl) - 15(+), *Ptilium crista-castrensis* (ml) - 6(I), 9(I), 10(I), 13(+), 15(+), *Ranunculus submarginatus* (hl) - 2(I), 8(+), 15(+), 16(+), *Rhinanthus vernalis* (hl) - 2(I), 15(r), *Rhodobryum roseum* (ml) - 15(+), *Ribes atropurpureum* (s1) - 8(+), *R. hispidulum* (s1) - (I), 2(I), 4(+), 5(I), *R. nigrum* (s1) - 4(+), 5(I), 7(+), *R. rubrum* (s1) - 15(+), *Rumex thyrsiflorus* (hl) - 3(I), 5(+), *Rhytidiadelphus* triquetrus (ml) - 10(+), 11(+), 13(I), 15(+), *Salix bebbiana* (s1) - 1(I), 4(+), 5(I), 7(+), 11(+), 13(+), 15(+), *S. cinerea* (s1) - 4(+), *S. pyrolifolia* (s1) - 18(I), *S. starkeana* (s1) - 10(I), 13(+), 15(+), *Saussurea elata* (hl) - 6(I), *S. latifolia* (hl) - 3(+), 4(+), 13(+), *S. purpurata* (hl) - 15(+), *Schizonepeta multifida* (hl) - 19(I), *Senecio erucifolius* (hl) - 1(I), 3(+), 4(+), 7(+), *S. nemorensis* (hl) - 8(+), 10(+), 15(+), *Silene chlorantha* (hl) - 13(+), *S. graminifolia* (hl) - 19(I), *Solanum kitagawae* (hl) - 5(+), *S. nigrum* (hl) - 3(+), *Sonchus arvensis* (hl) - 5(+), 8(+), *Spiraea chamaedryfolia* (s1) – 13(+), *S. hypericifolia* (s1) - 6(I), *Spiranthes amoena* (hl) - 15(+), *Stipa pennata* (hl) - 3(+), *Tanacetum vulgare* (hl) - 1(I), 3(I), 4(+), *Tomentypnum nitens* (ml) - 15(+), *Turritis glabra* (hl) - 2(I), 8(+), *Urtica dioica* (hl) - 2(I), 3(+), 4(+), 5(+), 6(I), 7(+), 8(+), *Valeriana officinalis* (hl) - 15(+), *Veratrum lobelianum* (hl) - 8(I), 9(I), 13(I), 15(+), *Verbascum nigrum* (hl) - 5(+), *Veronica incana* (hl) - 13(+), *V. longifolia* (hl) - 3(+), 4(+), 7(+), 13(I), *V. serpyllifolia* (hl) - 8(I), *Vicia lilacina* (hl) - 15(+), *V. nervata* (hl) - 13(I), *Viola dactyloides* (hl) - 18(I), *V. mauritii* (hl) - 15(+), 19(I).

Table V — Alliance *Lathyro gmelinii-Pinion sylvestris*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**9**	**11**	**12**	**13**	**14**	**15**	**16**
Mean altitude (m)		810	631	430	490	500	400	730	650	457	740	920	300	200	450	250	720
Mean cover of tree layer %		66	59	60	57	61	58	52	69	60	63	55	56	59	63	61	57
Mean cover of shrub layer (%)		35	52	24	16	12	20	25	2	6	3	4	4	1	9	0	7
Mean cover of herb layer (%)		74	69	71	87	73	88	66	76	86	87	72	83	93	73	65	83
Mean cover of moss layer (%)		9	2	5	4	3	4	10	2	3	1	3	+	+	5	+	1
Mean heigt of tree layer (m)		22	21	22	22	22	23	25	22	23	24	22	23	22	21	21	22
Mean heigh of shrub layer (cm)		54	160	68	150	150	170	94	82	64	79	62	90	140	72	98	130
Mean height of herb layer (cm)		68	49	56	89	84	92	71	86	79	77	63	68	75	52	46	49
Mean nr. of species in one relevé		49	51	59	68	64	58	60	64	78	63	45	47	47	50	64	49
Relevé area		Everywhere 200 m^2															
Number of species		109	108	153	174	153	120	80	134	130	113	55	176	85	157	141	111
Number of relevés		11	8	24	22	12	5	5	9	9	7	5	28	5	22	8	8
The main species of tree layer																	
Pinus sylvestris	-t1	V^4	V^4	V^3	V^4	V^4	V^4	.	.	V^4	V^4	.	II^3	V^2	IV^3	V^4	V^4
Betula pendula	-t1	V^2	V	V^2	V^2	V^2	V	V^2	V^4	V^3	V^3	V^2	V^4	V^2	V^2	V^2	V^2
Larix sibirica	-t1	.	.	.	+	.	.	V^4	I	III^2	.	V^4	.	.	III^2	V	II
D.S. Ass. ***Geranio albiflori-Pinetum*** = D.S. Suball. ***Geranio albiflori-Pinenion***																	
Cruciata krylovii	-hl	V	V	V	V	V	III	V	I^2	V	V	V	II	.	.	.	.
Erythronium sibiricum	-hl	V	V	V	V	V	V	V	III	IV	V	V	r	.	.	.	.
Geranium albiflorum	-hl	.	V	V	II^2	IV^2	I	V^2	I	IV^2	V	V^2	r	.	r	.	.
Cerastium pauciflorum	-hl	V	III	V	V	V	III	.	IV^2	IV	V^2	V^2	+	.	r	.	II
Spiraea chamaedryfolia	-s1	V^3	V^2	III^2	III^2	I	II	V^2	I	III	V	I	.	.	.	.	.
Euphorbia pilosa	-hl	II	IV	IV	V	V	II	V	IV	V	V	.	V	.	.	.	I
Lathyrus frolovii	-hl	IV	.	IV	III	II	II	II	IV	V^2	V	.	+	.	.	.	.
Primula macrocalyx	-hl	II	I	.	III	.	II	III	V	IV	.	.	.	.	.	.	.
Aconitum krylovii	-hl	I	I	III	III^2	III	IV	V^2	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Atrageno sibiricae-Pinetum sylvestris***																	
Caragana arborescens	-s1	.	V^2	.	I	.	I	.	.	.	.	V	+	.	.	.	.
Polygonatum odoratum	-hl	IV	V	II	III	III	II	.	III	I	III	.	II	II	r	.	.
Cirsium serratuloides	-hl	.	IV	.	I	+	.	.	II	.	.	.	+	I	.	.	.
D.S. Ass. ***Dryopterido expansae-Pinetum sylvestris***																	
Caragana frutex	-s1	I	II	V^2	.	.	II	.	.	.	.	.	.	.	.	.	.
Dryopteris expansa	-hl	I	II	III	II	II	.	I	.	I	II	.	.	.	.	.	.
Dianthus superbus	-hl	.	.	III	.	.	.	.	.	.	III	.	.	.	r	.	II
Lycopodium annotinum	-hl	.	I	III	.	+	.	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Dentario sibiricae-Pinetum sylvestris***																	
Urtica dioica	-hl	.	.	r	V	IV	IV	II	II	I	.	.	II	.	.	.	.
Circaea alpina	-hl	.	I	I	III	I	IV	.	.	.	I	.	.	.	+	I	.
Festuca gigantea	-hl	.	.	+	IV	IV	.	.	.	.	.	.	II	.	.	.	.
Corydalis bracteata	-hl	II	.	.	III	.	IV	.	II	.	.	.	r	.	.	.	.
Sanicula giraldii	-hl	.	.	I	II	II	III	.	.	.	.	.	.	.	.	.	.
Dryopteris filix-mas	-hl	II	I	II	III	III	.	.	.	I	II	.	I	.	.	.	.
Elymus caninus	-hl	.	.	r	III	I	II	I	.	II	.	.	+	.	.	.	.
Stachys sylvatica	-hl	.	.	.	III	II	.	.	.	.	.	.	I	.	.	.	.
D.S. Subass. ***D.s.-P.s. abietetosum sibiricae***																	
Abies sibirica	-s1	V	IV	IV	.	V	I^2	.	.	IV	I	.	I	.	I	.	.
Brunnera sibirica	-hl	.	II	+	.	IV	.	.	.	V^2	V^2	.	r	.	.	.	.
Daphne mezereum	-hl	.	IV	IV	.	IV	.	.	.	.	.	.	.	.	II	I	.
Oxalis acetosella	-hl	I	I	II	r	III^2	II	.	.	.	.	.	.	.	I	.	.
Pinus sibirica	-s1	II	V	IV	.	III	.	III	.	III	III	V	.	.	+	II	II
D.S. Subass. ***D.s.-P.s. matteuccietosum***																	
Matteuccia struthiopteris	-hl	+	.	.	r	II	V^3	.	.	.	.	.	I	.	II	.	.
Geum aleppicum	-hl	.	.	+	+	.	V	.	II	.	III	.	II	.	.	.	.
Dentaria sibirica	-hl	+	.	I	+	.	IV	.	.	.	.	.	.	.	.	.	.
Carex arnellii	-hl	.	.	.	I	I	IV	.	.	.	.	.	+	.	.	.	.
Humulus lupulus	-hl	.	.	.	r	+	III	.	.	.	.	.	.	.	.	.	.
Elymus sibiricus	-hl	.	.	.	r	.	III	.	.	.	.	.	.	.	.	.	.
Cerastium davuricum	-hl	.	.	r	+	I	III	.	I	III	.	.	.	.	.	.	.

Table V (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**9**	**11**	**12**	**13**	**14**	**15**	**16**
D.S. Ass. ***Saussureo parviflorae-Laricetum sibiricae***																	
Saussurea parviflora	-hl	.	.	.	I	.	I	V	.	.	.	.	.	.	.	II	II
Vicia megalotropis	-hl	II	II	II	I	I	.	V	II	I	III	.	I	II	I	.	.
Impatiens noli-tangere	-hl	.	I	r	I	I	I	IV	.	.	I	.	.	.	.	.	.
Hylocomium splendens	-ml	I	.	I	+	.	.	IV	.	.	III	II	.	.	II	II	I
Calamagrosti langsdorffii	-hl	.	.	+	II	II	II	III	.	.	II	.	.	.	II	II	.
D.S. Ass. ***Polygonato humilis-Betuletum pendulae***																	
Adenophora lamarckii	-hl	.	.	.	.	.	.	.	V	.	II	V	.	.	.	.	.
Campanula glomerata	-hl	.	.	.	.	.	.	.	IV	I	.	I	.	.	I	I	I
Polygonatum humile	-hl	.	.	.	.	.	.	.	IV	.	.	.	+	.	.	.	.
Delphinium retropilosum	-hl	.	.	.	.	.	.	.	IV	.	.	.	.	.	.	.	.
Phlomoides tuberosa	-hl	.	II	.	I	+	I	.	IV	I	I	.	III	.	r	.	.
Bromopsis pumpelliana	-hl	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.
D.S. Ass. ***Brunnero sibiricae-Pinetum sylvestris***																	
Anemonoides reflexa	-hl	.	.	.	.	.	.	.	II	V	V	II	I	.	II	.	II
Bistorta major	-hl	.	.	+	II	+	I	.	II	IV	IV	.	II	.	.	IV	.
Anemonoides jenisseens	-hl	.	.	.	.	.	.	.	I	III	III	.	.	.	.	.	.
Vicia lilacina	-hl	+	.	.	.	.	.	.	.	III	II	.	.	.	.	III	.
Allium microdictyon	-hl	.	.	.	.	.	.	.	.	II	III	.	.	.	II	V	II
D.S. Subass. ***B.s.-B.p. equisetosum sylvatici***																	
Equisetum sylvaticum	-hl	.	I	+	I	+	.	.	.	.	V	.	II	II	III²	V	I
Melilotoides platycarpos	-hl	+	I	.	r	.	.	.	II	II	V	V	II	IV	r	.	.
Deschampsia cespitosa	-hl	.	.	.	.	+	.	.	.	.	IV	.	.	.	.	.	.
Lysimachia vulgaris	-hl	.	.	r	I	+	II	.	.	.	III	.	r	II	.	.	.
Moehringia lateriflora	-hl	.	.	.	.	.	.	.	.	.	III	.	.	.	.	II	III
D.S. Ass. ***Paeonio anomalae-Laricetum sibiricae***																	
Calamagrostis pavlovii	-hl	.	.	.	.	.	.	.	.	.	.	V²	.	.	.	II	.
Vicia cracca	-hl	.	.	II	r	+	.	.	I	.	I	V	+	.	II	IV	IV
Valeriana alternifolia	-hl	.	.	.	.	.	.	.	I	.	.	V	.	.	.	.	.
Pedicularis resupinata	-hl	.	.	r	r	I	.	.	.	.	II	V	.	I	II	IV	I
Picea obovata	-s1	.	.	.	.	+	.	.	.	.	.	V	r	.	I	IV	I
Pyrola rotundifolia	-hl	.	.	.	.	.	.	.	II	III	.	V	I	.	II	II	II
Pyrola incarnata	-hl	.	.	r	r	+	.	.	.	II	II	IV	.	.	.	.	I
D.S. Ass. ***Trollio asiatici-Populetum tremulae*** = D.S. Suball. ***Geranio sylvaticae-Pinenion sylvestris***																	
Aegopodium podagraria	-hl	.	II	II	V²	III	IV²	.	I	.	.	.	IV²	V²	.	.	.
Lathyrus vernus	-hl	I	.	.	I	.	.	.	.	.	.	.	IV²	IV	V	V	I
Geranium sylvaticum	-hl	.	.	.	.	.	.	.	.	.	.	.	V	III	II	II	.
Carex pallescens	-hl	.	.	.	.	.	.	.	.	.	.	.	II	II	.	.	.
D.S. Ass. ***Melilotoido platycarpi-Pinetum sylvestris***																	
Astragalus glycyphyllos	-hl	.	.	.	+	+	.	.	.	.	.	.	+	V	.	.	.
Phragmites australis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	.	.
Agrostis gigantea	-hl	.	.	+	r	+	.	.	I	.	.	.	.	IV	.	.	.
Thalictrum simplex	-hl	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	.	.
Phleum pratense	-hl	.	.	.	.	.	.	.	I	.	.	.	r	IV	.	.	.
Inula salicina	-hl	.	.	.	.	.	.	.	II	.	.	.	+	III	.	I	.
D.S. Ass. ***Matteuccio-Pinetum sylvestris*** = D.S. Suball. ***Carici macrourae-Pinenion sylvestris***																	
Trientalis europaea	-hl	.	.	I	.	.	.	.	.	.	.	.	.	.	IV	IV	V
Vaccinium vitis-idaea	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	III	V	V
Gymnocarpium dryopteris	-hl	.	I	I	.	+	.	.	.	I	I	.	.	.	III	IV	II
Vicia venosa	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	V²
D.S. Ass. ***Spiraeo salicifoliae-Pinetum sylvestris***																	
Anemonoides altaica	-hl	III	IV	II	III	III	III	.	II	III	II	.	.	.	.	IV	I
Galium uliginosum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	.
Cypripedium macranthon	-hl	I	II	II	I	I	.	.	III	.	I	.	.	.	+	IV	.
Salix starkeana	-s1	.	.	.	.	.	.	.	.	.	.	.	r	.	r	III	.
Pyrola media	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.
Rubus arcticus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.

Table V (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**9**	**11**	**12**	**13**	**14**	**15**	**16**
Spiraea salicifolia	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.
Parnassia palustris	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
D.S. Ass. ***Duschekio fruticosae-Pinetum sylvestris***																	
Duschekia fruticosa	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	IV^2
Anemonastrum crinitum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	IV
Vaccinium myrtillus	-hl	.	.	I	.	.	.	.	.	.	II	.	.	.	I	I	IV
Trisetum sibiricum	-hl	.	.	.	III	I	I	V	II	IV	II	IV	+	.	.	I	III
D.S. All. ***Lathyro gmelinii-Pinion sylvestris***																	
Populus tremula	-t1	II	.	III	III^2	III	II	.	V^2	III	IV^2	.	IV^3	IV^3	V^3	V	V^2
Aconitum septentrionalis	-hl	V	V	V	V^2	V^2	IV^2	V^2	V^2	V^2	V^2	V^2	V	V^2	IV	V^2	V^2
Lathyrus gmelinii	-hl	V	V	V	V^2	V^2	II	V	V^2	V^2	V	.	V^2	V	IV	V	I
Stellaria bungeana	-hl	III	V	IV	V	V	V	V	.	III	.	IV^2	II^2	.	III	.	.
Calamagrostis obtusata	-hl	II	I	III	I	III	II	V^2	.	.	V	.	I	.	III^2	V^2	II
Athyrium filix-femina	-hl	II	IV	V	IV^2	V	IV^2	V	.	III	V	.	II	.	r	III	.
Milium effusum	-hl	II	II	+	V	IV	III	IV	.	IV	V	.	IV	I	III	II	III
Cirsium heterophyllum	-hl	.	.	r	III^2	III	.	.	.	V	V	.	II	IV	III	IV	II
Veratrum lobelianum	-hl	.	.	r	I	.	I	III	II	V	V	.	III	.	III	V	IV
Paris quadrifolia	-hl	I	I	II	II	II	III	.	I	II	IV	.	II	.	IV	III	IV
D.S. All. ***Vicio unijugae-Pinion sylvestris***																	
Vicia unijuga	-hl	IV	.	III	II	+	.	.	III	II	V	.	II	V	I	I	II
Lupinaster pentaphyllus	-hl	+	II	III	.	I	.	II	II	III	IV	.	I	V	+	IV	III
Ptarmica impatiens	-hl	.	I	+	+	I	.	IV	II	.	III	.	r	I	r	II	.
Geranium pseudosibiricum	-hl	+	I	r	II	.	I	.	III	.	.	V	.	.	III	II	II
Lathyrus pisiformis	-hl	II	II	.	II	.	.	I	II	I	I	.	r	II	.	.	.
Aquilegia sibirica	-hl	.	I	.	r	.	.	.	.	.	.	.	.	.	I	I	I
D.S. Ord. ***Carici macrourae-Pinetalia sylvestris***																	
Carex macroura	-hl	V^2	V^2	V^2	V^2	V^2	V^2	II	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2
Pteridium aquilinum	-hl	IV	V^2	V^2	V^2	V^2	III^2	.	III^2	V^2	V^2	.	IV^2	V	III^2	II^2	IV^2
Viola uniflora	-hl	III	IV	V	V	V	III^2	V	V^2	V^2	V	II	IV^2	.	V	IV	V^2
Cimicifuga foetida	-hl	V	V	III	IV	II	II	III	V	IV	II	V	r	.	I	I	.
Heracleum dissectum	-hl	III	IV	I	V	III	.	III	V^2	IV	V	V	IV	IV	III	III	V
Bupleurum aureum	-hl	III	I	II	V	III	I	V	III	V	V	.	V	III	.	IV	.
Trollius asiaticus	-hl	IV	.	III	V	V	I	V	V	IV	V	V	V	IV^2	IV	V^2	V
Aconitum volubile	-hl	I	V	IV	IV	III	III	IV	IV	IV	V	.	III	III	.	II	.
D.S. Cl. ***Brachypodio pinnati-Betuletea pendulae***																	
Calamagrostis arundinacea	-hl	V^2	V	V^2	V^2	IV^2	II^2	.	V^2	V^2	V^2	.	III	V	IV^2	II^2	IV^2
Rubus saxatilis	-hl	V	V^2	V^2	V^2	IV	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2
Vicia sepium	-hl	V	III	V	V	V	IV	IV	III	V	V	.	V	IV	V	V	II
Pulmonaria mollis	-hl	V	III	IV	V	IV	III	V	V	V	V	.	V	IV	V	IV	V
Lilium pilosiusculum	-hl	IV	IV	IV	V	V	II	IV	IV	IV	V	II	IV	II	III	V	IV
Brachypodium pinnatum	-hl	V^2	IV^2	V^2	V^2	III	III	IV	V^2	V^2	V	.	IV	V^2	IV^2	III^2	V^2
Agrimonia pilosa	-hl	II	I	IV	III	IV	III	.	IV	II	III	.	IV	III	r	.	I
Pleurospermum uralense	-hl	V	III	IV	V	III	I	V	V	V	V	II	V	V	I	IV	V
Angelica sylvestris	-hl	V	IV	V	V	V	I	V	V	IV	V^2	.	IV	IV	V	IV	IV^2
Iris ruthenica	-hl	IV	V^2	III^2	I	I	.	V^2	IV	V	V	.	III	II	III^2	IV^2	V^2
Hieracium umbellatum	-hl	I	II	III	+	I	.	.	.	II	V	.	.	II	II	III	I
Serratula coronata	-hl	.	.	.	II	.	I	.	II	IV	V	.	II	II	.	.	.
D.S. Cl. ***Querco-Fagetea***, ord. ***Fagetalia sylvaticae***																	
Melica nutans	-hl	V	V	V	V	V	II	.	.	V	V	.	II	II	IV	IV	V
Viola mirabilis	-hl	II	III	I	III	III	.	.	IV	.	.	.	I	.	.	.	.
Viburnum opulus	-s1	.	.	II	III	III	I	.	.	.	V	.	III	.	.	.	.
Adoxa moschatellina	-hl	+	II	II	III	III	V	V	II	III	.	.	II	.	.	.	.
Asarum europaeum	-hl	.	I	.	.	II	.	.	.	.	.	.	.	.	.	.	.
Brachypodium sylvaticum	-hl	.	.	.	.	II	.	.	.	.	.	.	+	.	.	.	.
Scrophularia nodosa	-hl	.	.	.	.	I	.	.	.	.	I	.	+	I	.	.	.
Epipactis helleborine	-hl	.	.	.	.	.	.	.	.	.	.	.	+	.	r	I	.
Galium odoratum	-hl	.	.	.	r	I	.	.	.	.	.	.	.	.	.	.	.
Poa nemoralis	-hl	.	I	.	.	+	I	.	.	.	I	.	r	.	.	I	.

Table V (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**9**	**11**	**12**	**13**	**14**	**15**	**16**
D.S. Cl. ***Molinio-Arrhenatheretea***																	
Galium boreale	-hl	V	V	V	V	IV	II	V	V	V	IV	V	IV	V	V	IV	V
Dactylis glomerata	-hl	II	IV	IV	V	V	III	II	II	V	V²	.	IV	V	.	.	.
Sanguisorba officinalis	-hl	III	I	I	III	I	.	III	IV	III	V	.	II	IV	II	II	V
Lathyrus pratensis	-hl	+	.	III	I	III	.	.	.	III	III	I	I	IV	III	V	.
Prunella vulgaris	-hl	.	.	II	I	III	.	.	.	.	I	.	I	II	.	.	.
Festuca rubra	-hl	.	.	r	r	+	II	.	.	.	.	.	.	.	.	.	.
Elytrigia repens	-hl	.	.	.	.	.	.	.	II	.	.	.	r	I	.	.	.
Trifolium pratense	-hl	.	.	.	.	+	.	.	.	.	I	.	I	II	+	.	.
Amoria repens	-hl	.	.	I	.	.	.	.	.	.	II	.	I	II	.	.	.
Poa pratensis	-hl	.	.	.	.	.	.	.	I	.	.	.	I	.	.	I	.
Agrostis clavata	-hl	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.
Alopecurus pratensis	-hl	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.	.
Festuca pratensis	-hl	.	.	.	.	.	.	.	I	.	.	.	+	I	.	.	.
Geranium pratense	-hl	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Cl. ***Vaccinio-Piceetea***																	
Pleurozium schreberi	-ml	IV²	V	IV	III	III	II	V	II	II	V	IV	r	.	IV	II	II
Ptilium crista-castrensis	-ml	III²	II	II	r	.	.	III	.	I	IV	.	.	.	IV	II	I
Dicranum polysetum	-ml	+	I	II	.	.	.	.	.	.	I	.	.	.	III	.	I
Orthilia secunda	-hl	.	.	.	.	.	.	.	.	.	I	.	+	.	III	II	.
Lonicera altaica	-s1	.	.	I	+	.	.	I	.	.	.	.	.	.	III	II	.
Pyrola minor	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.
Linnaea borealis	-hl	.	.	r	.	.	.	.	.	.	.	.	.	.	+	II	.
Other species:																	
Thalictrum minus	-hl	V	V	V	V	V	V	V	V	V	V	V²	V	IV	V	V	V
Maianthemum bifolium	-hl	III	IV	V	III	IV	III²	.	IV	V	V	IV	III	I	IV	V	V²
Crepis sibirica	-hl	IV	IV	IV	V²	V²	I	V	V²	V	V²	V	V²	III²	IV	V	V
Padus avium	-s1	II	II	V	V²	IV²	V²	.	II	IV	V²	.	III	.	III	.	III
Equisetum pratense	-hl	I	.	III	III	III	V	V	V	IV	I	V	II	I	III²	V	IV
Luzula pilosa	-hl	V	I	IV	II	III	.	.	.	V	V	.	.	.	III	II	IV
Viola hirta	-hl	V	IV	IV	III	I	I	.	III	III	.	.	II	.	.	.	.
Fragaria vesca	-hl	V	V	V	IV	IV	III	.	II	II	IV	.	IV²	I	I	II	.
Sorbus sibirica	-s1	III	III	IV	IV²	IV	III	.	.	II	V	.	II	.	III	III	II
Aegopodium alpestre	-hl	III	II	+	III	+	II	V	II	V	.	.	.	.	V	IV	V
Rhytidiadelphus triquetrus	-ml	III²	III	III	IV	III	III	V²	.	.	IV	III	.	.	III	II	.
Filipendula ulmaria	-hl	I	.	r	IV	II	IV²	I	II	III	V	.	III	IV²	I	II	.
Rubus idaeus	-s1	II	.	II	III	IV	II	I	.	III	II	.	II	.	III	II	.
Vicia sylvatica	-hl	V	II	V	V	V	I	.	.	IV	V	.	IV	IV²	V	.	I
Solidago virgaurea	-hl	I	IV	IV	II	IV	I	.	III	II	III	.	I	I	.	II	I
Atragene sibirica	-hl	III	V	IV	r	I	I	I	II	I	.	IV	.	.	III	V	II
Ranunculus monophyllus	-hl	II	.	I	III	II	I	V	IV	V	I	.	IV	.	r	.	.
Polemonium coeruleum	-hl	.	I	r	IV	III	III	IV	IV	V	I	III	IV	.	II	IV	.
Cacalia hastata	-hl	.	II	II	IV²	V	V	V	IV	IV	III	V	IV	III	III	III	I
Lamium album	-hl	.	II	.	III	III	V	V	I	III	.	II	I	.	r	.	.
Anthriscus sylvestris	-hl	.	I	I	III	III	I	V	.	IV	III	.	III	III	.	.	.
Poa sibirica	-hl	I	III	II	II	II	II	V	II	IV	III	V	+	.	r	I	.
Populus tremula	-s1	+	.	II	I	III	+	II	V	+	IV	.	III	IV	V	IV	V
Senecio nemorensis	-hl	.	.	r	II	II	I	IV	II	.	.	V	+	.	r	.	.
Anemonoides caerulea	-hl	IV	V	V	V	V	V	.	.	.	.	.	.	.	.	.	.
Ranunculus grandifolius	-hl	.	.	II	IV	V	III²	IV	.	V	.	.	.	.	.	.	.
Rosa acicularis	-s1	II	.	.	.	.	.	.	III	.	.	IV	I	.	IV	IV	V
Pinus sylvestris	-s1	.	.	III	.	II	II	.	.	.	.	.	.	III	IV	II	IV
Larix sibirica	-s1	.	.	.	.	.	.	II	.	.	.	III	.	.	II	II	.
Betula pendula	-s1	I	.	.	II	II	.	I	II	I	.	I	.	.	III	III	I
Lathyrus humilis	-hl	I	.	.	II	.	II	.	IV	I	.	V²	+	.	IV²	IV	V
Cypripedium guttatum	-hl	II	.	II	+	I	.	.	III	I	V	.	.	.	II	IV	I
Chamaenerion angustifolium	-hl	+	II	.	I	I	.	I	III	.	.	III	I	.	IV	IV	IV
Rhodobryum roseum	-ml	.	II	I	II	III	V	V	.	.	II	.	.	.	.	.	I
Crepis lyrata	-hl	.	I	I	III	IV	I	.	I	I	III	.	I	.	.	.	.
Ranunculus propinquus	-hl	.	.	.	.	.	.	.	IV	.	V	V	I	I	III	IV	IV
Veronica chamaedrys	-hl	.	I	III	III	III	II	.	.	.	V²	.	II	.	.	.	.
Paeonia anomala	-hl	.	.	.	r	.	.	IV	IV	.	.	V	I	.	r	.	.

Table V (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**9**	**11**	**12**	**13**	**14**	**15**	**16**
Conioselinum tataricum	-hl	.	.	.	II	.	.	V	II	.	.	V	r	.	+	.	.
Ribes hispidulum	-sl	+	.	r	II	III	II	I	.	I	II	.	+	.	.	II	.
Salix caprea	-sl	.	I	I	r	II	.	.	I	I	II	.	II	.	IV	I	III
Myosotis krylovii	-hl	.	.	.	II	III	.	.	.	.	II	.	.	.	.	.	.
Euphorbia discolor	-hl	III	I	+	r	.	.	.	.	.	.	.	r	.	.	.	.
Plagiomnium cuspidatum	-ml	.	.	.	+	I	II	.	.	.	.	.	.	.	III	.	.
Rosa majalis	-sl	II	.	I	+	+	I	.	II	I	.	.	II	.	r	III	I
Hypericum hirsutum	-hl	+	II	I	II	II	.	.	.	.	.	.	.	.	.	.	.
Dryopteris carthusiana	-hl	II	II	+	.	I	.	.	.	II	.	.	I	.	.	.	.
Dactylorhiza fuchsii	-hl	+	.	I	II	II	.	.	.	I	II	.	r	.	.	.	.
Veratrum nigrum	-hl	+	.	II	II	.	.	.	II	.	.	.	+	.	.	.	.
Adonis sibirica	-hl	.	II	II	r	+	.	.	.	.	.	.	.	.	.	.	.
Origanum vulgare	-hl	.	II	r	.	.	.	.	I	II	.	.	I	.	.	.	.
Viola biflora	-hl	.	I	II	r	II	.	.	.	.	.	.	.	.	.	.	.
Spiraea media	-sl	.	.	II	+	.	I	.	I	.	I	.	II	.	II	II	II
Potentilla fragarioides	-hl	.	.	.	II	.	.	.	.	I	I	.	+	.	.	.	.
Arabis pendula	-hl	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Scutellaria galericula	-hl	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Chelidonium majus	-hl	.	.	.	.	.	II	.	.	.	.	.	.	.	r	.	.
Galium triflorum	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	r	.	.
Bromopsis inermis	-hl	.	.	.	.	.	I	II	.	.	.	.	.	.	.	.	.
Geranium bifolium	-hl	.	.	.	.	.	.	.	II	.	.	.	I	II	.	.	.
Calamagrostis epigeios	-hl	.	.	.	.	.	I	.	II	.	.	.	II	II	+	.	.
Salix bebbiana	-sl	.	.	.	.	.	.	.	II	.	.	.	I	I	r	.	.
Zigadenus sibiricus	-hl	.	.	.	.	.	.	.	II	.	II	I	.	.	.	.	.
Aconitum barbatum	-hl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.
Rosa acicularis	-sl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.
Ribes nigrum	-sl	.	.	.	r	.	.	.	.	II	.	.	.	.	r	II	.
Galium aparine	-hl	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Adenophora liliifolia	-hl	.	.	.	.	+	.	I	I	.	.	.	II	.	.	.	.
Hypericum elegans	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.
Viola montana	-hl	.	I	II	.	+	.	.	.	.	.	.	.	II	r	.	.
Trommsdorfia maculata	-hl	.	.	r	.	.	.	.	.	.	I	.	.	.	II	II	I
Platanthera bifolia	-hl	+	I	.	I	.	.	.	.	.	.	.	.	.	.	II	.
Vicia multicaulis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Dendranthema zawadskii	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Saussurea purpurata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	I
Polytrichum strictum	-ml	.	.	.	.	.	.	.	.	.	.	.	.	.	II	I	I
Dicranum fuscescens	-ml	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Angelica tenuifolia	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	r	II	.
Campanula cervicaria	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Poa trivialis	-hl	.	.	.	.	.	.	.	I	.	.	.	r	.	.	II	.
Ranunculus submarginatus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Pedicularis incarnata	-hl	.	.	.	I	+	.	.	.	.	.	.	.	I	r	II	.
Carex cespitosa	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Dactylorhiza maculata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	r	II	I
Achillea asiatica	-hl	.	I	I	r	.	.	.	.	.	.	.	.	.	+	II	.
Carex korshinskyi	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Ledum palustre	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Climacium dendroides	-ml	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	II
Hieracium ganeschinii	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Festuca ovina	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Thesium repens	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	r	I	II

Table V (continuation)

Species with few occurrences:

Aconitum ambiguum (hl) - 14(+), *Aconogonon alpinum* (hl) - 1(+), 2(I), 3(+), 4(I), 8(I), 9(I), *Actaea erythrocarpa* (hl) - 1(+), 14(I), 15(I), 16(I), *Adenophora coronopifolia* (hl) - 8(I), *Agrostis vinealis* (hl) - 8(I), *Alchemilla officinalis* (hl) - 3(+), 4(+), *A. xanthochlora* (hl) - 8(I), *Alfredia cernua* (hl) - 4(+), 12(+), *Anemone sylvestris* (hl) - 8(I), 12(+), *Angelica decurrens* (hl) - 8(I), 12(+), *Antennaria dioica* (hl) - 14(I), *Anthoxanthum odoratum* (hl) - 9(I), *Arctium tomentosum* (hl) - 12(+), 13(I), *Artemisia dracunculus* (hl) - 13(I), *A. integrifolia* (hl) - 10(I), *A. vulgaris* (hl) - 2(I), 4(+), 5(+), 8(I), 12(I), 13(I), *Aulacomnium palustre* (ml) - 14(+), 15(I), *Bergenia crassifolia* (hl) - 3(+), *Botrychium virginianum* (hl) - 14(+), *Brachytheciu salebrosum* (ml) - 14(+), *Bryum species* (ml) - 15(I), *Caltha palustris* (hl) - 4(+), *Campanula altaica* (hl) - 3(+), 12(I), *Carum carvi* (hl) - 13(I), *Cardamine macrophylla* (hl) - 1(I), *Carex atherodes* (hl) – 13(I), *C. globularis* (hl) - 14(+), *C. loliacea* (hl) - 15(I), C. (hl) - 3(+), 5(I), *Centaurea scabiosa* (hl) - 12(+), *Cerastium arvense* (hl) - 12(+), *Circaea lutetiana* (hl) - 6(I), 10(I), *Cirsium setosum* (hl) - 8(I), 12(+), *Cotoneaster melanocarpus* (s1) - 1(+), 4(+), 6(I), *Crataegus sanguinea* (s1) - 8(I), 12(I), *Crepis praemorsa* (hl) - 8(I), 10(I), 14(+), 15(I), *Cypripedium calceolus* (hl) - 1(I), 14(+), *Cystopteris fragilis* (hl) - 15(I), *Delphinium crassifolium* (hl) - 15(I), *D. elatum* (hl) - 4(+), 5(+), 7(I), 10(I), 12(I), 14(+), 15(I), *Dicranum* sp. (ml) - 1(+), *Diplazium sibiricum* (hl) - 3(I), 4(+), 5(+), 6(I), 16(I), *Elymus komarovii* (hl) - 12(+), *Epipogium aphyllum* (hl) - 14(+), *Equisetum arvense* (hl) - 15(I), *E. hyemale* (hl) - 3(+), 14(+), 15(I), *Epilobium montanum* (hl) - 1(+), 3(+), 12(I), *Eurhynchium* sp. (ml) - 14(r), *Festuca extremiorientalis* (hl) - 4(+), 6(I), *Filipendula vulgaris* (hl) - 12(I), *Fragaria viridis* (hl) - 8(I), 13(I), *Frangula alnus* (s1) - 10(I), 12(I), *Galatella macrosciadia* (hl) - 8(I), *Galeopsis bifida* (hl) - 5(+), 12(+), *Galium verum* (hl) - 12(+), *Geranium robertianum* (hl) - 16(I), *Geum rivale* (hl) - 9(I), 12(+), *Glechoma hederacea* (hl) - 3(+), 4(+), 6(I), 8(I), 12(+), *Glyceria lithuanica* (hl) - 15(I), *Gymnocarpium robertianum* (hl) - 3(+), *Helictotrichon pubescens* (hl) - 4(+), 6(I), 7(I), 12(+), *Hesperis sibirica* (hl) - 4(+), 7(I), *H. korshinskyi* (hl) - 16(I), *H. pilosella* (hl) - 16(I), *H. virosum* (hl) - 4(+), *Hypericum perforatum* (hl) - 12(+), *Leucanthemum vulgare* (hl) - 3(+), 5(+), *Lonicera pallasii* (s1) - 1(+), *L. tatarica* (s1) - 12(+), *Luzula multiflora* (hl) - 5(+), *Malaxis monophyllos* (hl) - 4(+), 8(I), 14(+), 16(I), *Marchantia polymorpha* (ml) - 15(I), *Medicago falcata* (hl) - 13(I), *Melandrium album* (hl) - 5(I), 8(I), *Mitella nuda* (hl) - 14(+), *Mnium* sp. (ml) - 8(I), *Myosotis palustris* (hl) - 3(+), 5(I), 6(I), 12(+), *Oberna behen* (hl) - 4(+), 6(I), 11(I), 12(+), *Orobanche coerulescens* (hl) - 14(+), *O. krylowii* (hl) - 8(I), *Osmorhiza aristata* (hl) - 3(+), 5(+), *Phegopteris connectilis* (hl) - 3(I), 16(I), *Plantago media* (hl) - 12(+), *Poa palustris* (hl) - 12(+), 14(+), *P. remota* (hl) - 1(+), 4(I), 12(+), *P. urssulensis* (hl) - 9(I), 16(I),16(I), *Rhododendron dauricum* (s1) - 6(I), 16(I),16(I), *Solidago dahurica* (hl) - 14(+), 16(I),16(I), *Pulsatilla patens* (hl) - 14(+), 16(I), *Ranunculus acris* (hl) - 12(+), *R. japonicus* (hl) - 16(I), *R. polyanthemos* (hl) - 5(+), 12(I), 14(+), *R. repens* (hl) - 12(+), 13(I), *Ribes procumbens* (s1) - 15(I), *R. rubrum* (s1) - 14(+), *Rubus humulifolius* (hl) - 15(I), *Salix cinerea* (s1) - 8(I), 13(I), *S. dasyclados* (s1) - 15(I), *Sambucus sibirica* (s1) - 3(+), 4(+), 5(I), 6(I), 9(I), 14(+), 16(I), *Sanionia uncinata* (ml) - 14(+), *Saussurea controversa* (hl) - 4(+), *S. latifolia* (hl) - 4(+), 5(+), 9(I), 10(I), *S. stubendorffi* (hl) - 15(I), *Scirpus sylvaticus* (hl) - 12(+), *Scorzonera radiata* (hl) - 15(I), *Silene repens* (hl) - 14(+), *Sorbaria sorbifolia* (s1) - 15(I), *Stachys palustris* (hl) - 12(+), *Stellaria crassifolia* (hl) - 7(I), *S. graminea* (hl) - 12(+), 13(I), *Tanacetum vulgare* (hl) - 8(I), 2(+), *Taraxacum officinale* (hl) - 8(I), 12(I), 13(I), *Veronica longifolia* (hl) - 4(+), *Vicia amoena* (hl) - 16(I), *V. tenuifolia* (hl) - 12(I), *Viola arenaria* (hl) - 10(I), *V. canina* (hl) - 12(I), 14(+), *V. mauritii* (hl) - 16(I), *V. selkirkii* (hl) - 14(I), 16(I).

Table VI — Order *Chamaecytiso ruthenici-Pinetalia sylvestris*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Mean altitude (m)		350	370	-	-	-	-	-	-	-	-
Mean cover of tree layer %		58	60	50	57	45	50	63	55	55	60
Mean cover of shrub layer (%)		2	8	5	2	6	12	5	2	1	14
Mean cover of herb layer (%)		73	68	60	55	25	80	56	60	69	73
Mean cover of moss layer (%)		2	1	7	3	5	-	0	22	2	6
Mean number of species in one relevé		65	70	78	83	77	46	66	52	57	60
Relevé area (m^2)		200	200	625	625	400-1000	400	1000	100	100	100
Number of species		128	170	206	218	162	90	188	128	137	121
Number of relevés		8	13	15	12	30	7	9	20	20	10
Main species of tree layer											
Betula pendula	-t1	V^4	V^4	I	III	I	.	V^4	III	V^3	.
Pinus sylvestris	-t1	.	I	V^2	V^4	V^3	V^2	.	V^3	IV^3	V^4
Larix sibirica	-t1	.	.	V^4	III^2	IV^2	V^3	.	II	.	.
Populus tremula	-t1	IV^2	II^2	.	.	.	.	III^2	I	II	.
Betula pubescens	-t1	.	.	+	III^2	.	.	.	V^3	I	II
D.S. Ass. ***Saussureo controversae-Betuletum pendulae***											
Pteridium aquilinum	-hl	V^2	III^2	.	.	.	.	.	r	+	.
Viola montana	-hl	V	.	.	.	r	.	.	.	.	.
Saussurea controversa	-hl	IV	+	.	.	.	.	.	r	II	.
Inula salicina	-hl	IV	I	I	.	+	.	II	.	.	.
Crepis praemorsa	-hl	IV	II	.	.	III	.	I	.	.	.
Orthilia secunda	-hl	IV	.	.	III	II	.	.	II	II	.
D.S. Ass. ***Genisto tinctoriae-Betuletum pendulae***											
Euphorbia virgata	-hl	II	V	.	.	.	.	.	.	.	.
Carex tomentosa	-hl	III	V^2	.	.	.	.	.	.	.	.
Pimpinella saxifraga	-hl	.	IV	.	II	.	II	I	.	.	.
Valeriana wolgensis	-hl	II	IV	.	+	.	.	.	.	.	.
Festuca pseudovina	-hl	I	IV	+	.	.	.	IV	.	r	.
Cerasus fruticosa	-s1	I	IV^2	.	+	II	.	III	.	.	.
Carex praecox	-hl	II	IV^2	.	.	.	.	III	.	.	.
Artemisia macrantha	-hl	.	IV	.	.	.	.	I	.	.	.
Genista tinctoria	-hl	.	III	.	.	.	.	II	.	.	.
Tanacetum vulgare	-hl	.	III	.	.	.	.	I	.	.	.
Stellaria graminea	-hl	I	III	I	I	.	III	I	.	.	+
Tephroseris integrifolia	-hl	I	III	.	+	I	.	II	.	.	.
Artemisia latifolia	-hl	I	III	.	.	.	.	I	.	.	.
Carex obtusata	-hl	II	III	+	.	.	.	.	.	.	.
D.S. Ass. ***Pyrethro corymbosi-Pinetum sylvestris***											
Poa nemoralis	-hl	I	II	V^2	IV	r	III	III	.	.	.
Pyrethrum corymbosum	-hl	.	.	V	V	.	.	II	.	.	.
Dactylis glomerata	-hl	I	+	V^2	V	.	I	II	V	V	V
Stellaria holostea	-hl	.	.	V	V	II	I	I	IV	IV	V
Bupleurum aureum	-hl	.	.	III	IV	.	.	.	V	V	.
Campanula persicifolia	-hl	.	.	IV	IV	II	.	II	II	I	.
Galeopsis bifida	-hl	.	.	III	IV	.	.	.	.	.	.
Hylotelephium caucasicum	-hl	.	.	IV	III	.	III	.	.	.	.
Quercus robur	-t3	.	.	IV	III	.	.	I	.	.	.
Agrostis gigantea	-hl	.	.	III	II	.	.	.	.	.	.
Rhytidiadelphus triquetrus	-ml	.	.	III	III	I	.	.	III	II	II
Variant ***Larix sibirica***											
Aconitum anthora	-hl	.	.	III	+	r	I	II	.	.	+
Hieracium virosum	-hl	.	.	III	I	.	.	.	.	.	.
Variant ***Pinus sylvestris***											
Dicranum scoparium	-ml	I	I	II	IV	II	.	I	r	.	I
Veronica officinalis	-hl	.	.	+	III	.	.	.	.	.	.
D.S. Ass. ***Carici caryophylleae-Pinetum sylvestris***											
Aconopogon alpinum	-hl	.	+	I	I	V	IV	III	r	.	+
Festuca rupicola	-hl	.	.	.	+	V	.	.	.	.	.

Table VI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Viola rupestris	-hl	.	.	.	.	V	.	.	.	.	.
Galium ruthenicum	-hl	.	.	.	.	V	.	II	.	.	.
Seseli krylovii	-hl	.	.	.	.	V	IV	.	.	.	.
Silene repens	-hl	.	.	.	.	V	.	IV	.	.	.
Steris viscaria	-hl	.	.	I	.	V	.	.	.	.	.
Centaurea sibirica	-hl	.	.	.	.	V	.	.	.	.	.
Antennaria dioica	-hl	.	+	II	III	V	III	.	.	.	.
Caragana frutex	-s1	.	.	.	+	IV[2]	.	V[2]	.	.	.
Aster alpinus	-hl	.	.	.	.	IV	.	.	.	.	.
Aulacospermum multifidum	-hl	.	.	.	.	IV	.	.	.	.	.
Dianthus versicolor	-hl	.	.	.	.	IV	.	.	.	.	.
Poa transbaicalica	-hl	.	.	.	.	IV	.	I	.	.	.
Centaurea ruthenica	-hl	.	.	.	.	III	.	I	.	.	.
Tragopogon orientalis	-hl	.	+	.	.	III	.	.	.	r	.
Turritis glabra	-hl	.	.	I	II	III	.	.	.	.	.
Ptilium crista-castrensis	-ml	.	.	I	I	III	I	.	.	II	+
D.S. Ass. ***Calamagrostio arundinaceae-Laricetum sibiricae***											
Agrimonia eupatoria	-hl	.	.	I	III	.	IV[2]	.	.	I	II
Festuca rubra	-hl	.	+	I	.	.	IV	.	.	.	.
Carex pediformis	-hl	.	.	.	.	.	IV	I	.	.	.
Campanula bononiensis	-hl	.	.	.	.	.	III	II	r	r	.
Elymus caninus	-hl	.	.	+	+	r	III	.	r	r	+
Crataegus sanguinea	-s1	.	+	.	.	.	III[2]	.	.	.	.
Lathyrus tuberosus	-hl	.	.	.	.	.	III	.	.	.	.
Euphorbia esula	-hl	.	.	.	.	.	III	.	.	.	.
Vaccinium vitis-idaea	-hl	.	.	.	.	.	III	.	.	.	.
D.S. Ass. ***Serratulo gmelinii-Betuletum pendulae***											
Filipendula ulmaria	-hl	.	+	.	+	.	V	V	II	r	V
Serratula gmelinii	-hl	.	.	.	.	.	.	IV	.	.	.
Galatella biflora	-hl	.	II	.	.	.	.	III	.	.	.
Bromopsis inermis	-hl	.	+	+	+	.	.	III	.	.	.
Plantago urvillei	-hl	I	II	.	+	.	.	III	.	.	.
Erysimum hieracifolium	-hl	.	+	+	.	II	.	III	.	.	.
D.S. Ass. ***Bupleuro longifoliae-Pinetum sylvestris***											
Trommsdorfia maculata	-hl	I	+	II	I	r	.	I	IV	IV	+
Thalictrum flavum	-hl	.	.	I	.	+	.	I	IV	III	.
Potentilla erecta	-hl	.	.	.	.	.	.	.	III	III	+
D.S. Subass. ***B.l.-P.s. typicum***											
Sorbus sibirica	-s1	.	.	.	.	.	.	.	III	.	.
Moehringia lateriflora	-hl	I	.	+	+	.	.	.	III	I	I
D.S. Subass. ***B.l.-P.s. seselietosum libanotis***											
Euphorbia subcordata	-hl	I	.	I	.	V	.	II	r	IV	I
D.S. Ass. ***Myosotido sylvaticae-Pinetum sylvestris***											
Oxalis acetosella	-hl	.	.	.	.	.	.	.	.	.	V[2]
Padus avium	-s1	II	+	.	.	.	.	.	II	II	V[2]
Myosotis sylvatica	-hl	.	.	.	.	.	.	.	.	.	V
Pyrola minor	-hl	.	.	.	.	.	.	.	II	r	IV
Glechoma hederacea	-hl	.	I	.	.	.	III[2]	I	.	.	IV
Ranunculus propinquus	-hl	.	.	.	.	.	.	.	r	.	IV
Prunella vulgaris	-hl	.	.	I	III	.	.	.	r	r	IV
Geum urbanum	-hl	.	.	I	III	.	.	.	.	r	III
Hypericum elegans	-hl	.	.	.	.	.	.	.	r	.	III
Carex pilosa	-hl	.	.	.	.	.	.	.	.	.	III[2]
Abies sibirica	-t2	.	.	.	.	.	.	.	.	.	III
Rubus idaeus	-s1	.	+	+	.	r	.	.	r	.	III[2]
Paris quadrifolia	-hl	.	.	.	.	.	.	.	I	.	III
D.S. All. ***Veronico teucrii-Pinion sylvestris***											
Filipendula vulgaris	-hl	V	V	V	V	V	V	III	+	III	.

Table VI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Origanum vulgare	-hl	V	V	V	V	V	III	III	.	IV	+
Seseli libanotis	-hl	V^2	V^2	V	IV	V	.	V	+	V	+
Dracocephalum ruyschiana	-hl	II	IV	V	IV	IV	.	II	.	II	.
Poa angustifolia	-hl	.	II	III	III	+	.	III	.	.	.
Phlomoides tuberosa	-hl	I	IV	II	+	II	V	V	.	.	.
Elytrigia repens	-hl	.	III^2	+	II	V	IV	IV^2	.	.	.
Artemisia sericea	-hl	.	IV^2	+	+	V	.	III	.	.	.
Fragaria viridis	-hl	.	II	I	+	V	II^2	V^2	.	.	.
Phleum phleoides	-hl	.	III	III	II	IV	IV	II	.	r	.
Galium verum	-hl	.	V^2	IV	II	I	III	II	.	.	.
Artemisia armeniaca	-hl	III	V	II	+	V	.	IV	.	.	.
Veronica teucrium	-hl	V	V^2	II	III	.	.	II	.	.	.
Cotoneaster melanocarpus	-s1	IV	V^2	I	I	.	V^2	IV	.	+	+
Carex caryophyllea	-hl	II	IV	+	II	V	.	I	.	.	.
Veronica spicata	-hl	.	II	II	+	V	III	II	.	.	.
Ranunculus polyanthemos	-hl	V	V	II	III	+	II	II	r	.	.
Pulsatilla patens	-hl	I	II	III	III	V	II	I	.	I	.
Linaria vulgaris	-hl	I	I	III	III	IV	.	II	.	.	.
D.S. All. ***Trollio europaei–Pinion sylvestris***											
Aegopodium podagraria	-hl	.	.	II	IV	.	I	II	V^2	V^2	V^2
Aconitum septentrionale	-hl	.	.	+	II	.	.	I	V^2	III	IV^2
Maianthemum bifolium	-hl	II	.	.	.	.	I	.	V	IV	IV
Bistorta major	-hl	II	+	II	I	.	III	II	V	V	V
Luzula pilosa	-hl	.	.	.	.	+	.	.	IV	IV	V
Ranunculus auricomus	-hl	.	.	.	.	.	.	.	IV	III	IV
Succisa pratensis	-hl	.	.	.	.	.	.	.	IV	IV	V
Cerastium pauciflorum	-hl	.	.	+	I	.	.	.	V	III	V
Milium effusum	-hl	.	.	+	II	.	.	I	III	II	IV
Cirsium heterophyllum	-hl	I	.	.	I	.	.	.	IV	II	IV
Lathyrus gmelinii	-hl	.	.	.	.	.	.	.	III	II	I
Trientalis europaea	-hl	.	.	.	.	.	.	.	III	+	V
Ranunculus acris	-hl	.	.	.	+	.	.	.	II	IV	III
D.S. Ord. ***Chamaecytiso ruthenici-Pinetalia sylvestris***											
Chamaecytisus ruthenicus	-h1	V^2	V^2	V	V	V	III	III	II	V	I
Trifolium medium	-hl	V^2	V^2	III	IV	.	III	IV	III	III	I
Stachys officinalis	-hl	V	V	V	V	.	II	II	V	IV	IV
Adenophora liliifolia	-hl	V^2	V	II	II	III	.	V	IV	IV	.
Primula macrocalyx	-hl	I	I	IV	V	I	III	II	IV	V	IV
Trollius europaeus	-hl	V	I	.	I	.	I	.	V	V	IV
Viola collina	-hl	IV^2	III	V	V	V	.	.	.	.	.
Carex rhizina	-hl	IV^2	II^2	V^2	IV^2	r	.	II	I	II	.
Inula hirta	-hl	.	II	III	III	.	.	III	I	II	.
Galium tinctorium	-hl	V	V	III	III	.	III	III	.	.	.
Carex digitata	-hl	.	.	I	III	V	.	.	III	III	+
Veronica chamaedrys	-hl	IV	III	V	V	r	II	II	V	V	V^2
Silene nutans	-hl	IV	III	V	IV	V	III	IV	+	II	.
Geranium pseudosibiricum	-hl	V	V	IV	IV	V	.	IV	.	.	.
Veronica spuria	-hl	.	II	IV	II	.	.	II	.	.	.
Digitalis grandiflora	-hl	.	+	V	IV	I	.	.	III	IV	II
Viola canina	-hl	.	.	V	V	II	.	II	IV	IV	V
D.S. Cl. ***Brachypodio pinnati-Betuletea pendulae***											
Rubus saxatilis	-hl	V^2	V^2	V	V^2	V^2	IV	V^3	V^2	V^2	IV^2
Calamagrostis arundinacea	-hl	V^2	V^2	V^2	V^2	V^2	V^3	V^2	V^2	V^2	V^2
Brachypodium pinnatum	-hl	V^2	V^2	V^2	V^2	V	III^2	V^2	V^2	V^2	V
Serratula coronata	-hl	II	III	+	.	.	.	IV	.	.	.
Lilium pilosiusculum	-hl	IV	III	II	II	II	II	II	II	V	I
Pleurospermum uralense	-hl	IV	II	I	II	.	.	II	IV	IV	.
Vicia sepium	-hl	V	II	I	IV	r	.	.	IV	V	V
Pulmonaria mollis	-hl	V	V	III	V	.	III^2	III	V	V	V
Agrimonia pilosa	-hl	IV	III	.	.	.	.	.	.	.	.
Angelica sylvestris	-hl	IV	.	.	II	.	.	I	IV	II	.
Hieracium umbellatum	-hl	IV	IV	IV	V	V	.	IV	III	IV	+

Table VI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
D.S. Cl. ***Querco-Fagetea***											
Viola mirabilis	-hl	V	V	II	III	I	IV	III	IV	V	V
Lathyrus vernus	-hl	IV^2	II	IV	V	IV	I	II	V	V	V
Melica nutans	-hl	.	.	V	V	II	III	II	V	IV	V
D.S. Cl. ***Molinio-Arrhenatheretea***											
Sanguisorba officinalis	-hl	V	IV	I	II	V	V	V^2	V	V	IV
Galium boreale	-hl	IV	V	V	V	V	V	V	V	V	V
Vicia cracca	-hl	I	III	IV	IV	r	III	IV	I	IV	.
Achillea millefolium	-hl	IV	IV	V	V	V	IV	IV	+	III	II
Lathyrus pratensis	-hl	II	III	II	II	II	.	I	II	III	III
Poa pratensis	-hl	I	III^2	II	.	r	III	II	+	I	II
Festuca pratensis	-hl	.	II	+	II	.	III	II	r	+	II
Other species:											
Pinus sylvestris	-t2	.	.	V^2	V^2	V^2	.	.	.	.	+
Pinus sylvestris	-t3	.	.	IV^2	V^2	V	III	.	.	.	.
Larix sibirica	-t2	.	.	V^2	II^2	V^2	.	.	.	.	.
Larix sibirica	-t3	.	.	IV^2	III	V	II	.	.	.	.
Betula pendula	-t2	IV	V	IV	IV^2	IV	V^2	V	.	.	I
Betula pendula	-t3	II	II	IV	V^2	V	IV	IV	.	.	.
Betula pubescens	-t2	.	.	I	III^2	.	.	.	.	.	II
Betula pubescens	-t3	.	.	III	IV^2	.	.	.	.	.	.
Sorbus aucuparia	-t3	.	.	I	II	IV	.	.	.	.	.
Sorbus aucuparia	-s1	.	.	.	.	.	.	.	.	III	V^2
Salix caprea	-t3	.	.	II	+	I	.	.	.	.	.
Populus tremula	-t2	.	.	+	.	.	.	III^2	.	.	.
Populus tremula	-t3	III	II	II	III	.	II	IV	.	.	.
Padus avium	-t3	.	.	.	III	.	III^2	III	.	.	.
Tilia cordata	-t3	.	.	II	I	.	.	.	.	.	.
Acer platanoides	-t3	.	.	II	.	.	.	.	.	.	.
Lupinaster pentaphyllus	-hl	V	IV	IV	III	V	V	V	IV	V	III
Solidago virgaurea	-hl	V	II	V	V	V	III	III	V	V	V
Fragaria vesca	-hl	V^2	V^2	V	V	II	V^2	.	III	IV	V^2
Polygonatum odoratum	-hl	V^2	V^2	V	IV	V	III	II	III	IV	I
Campanula glomerata	-hl	V	IV	.	+	IV	III	III	IV	I	I
Lathyrus pisiformis	-hl	V	IV	V	V	V	IV	V	I	III	+
Rosa majalis	-s1	V	V	V	V	+	V	V^2	I	.	.
Geranium sylvaticum	-hl	IV	.	III	IV	+	IV	.	V	V	V
Heracleum sibiricum	-hl	IV	IV	I	+	.	.	III	+	V	.
Viola hirta	-hl	IV	IV	+	+	.	V	III	IV	V	V
Thalictrum minus	-hl	II	IV	II	II	III	V	IV	.	.	.
Thalictrum simplex	-hl	II	IV	II	II	.	.	.	.	I	.
Rosa acicularis	-s1	.	.	.	.	III	.	.	II	II	IV
Hylotelephium triphyllum	-hl	III	II	.	.	III	.	III	+	II	.
Filipendula stepposa	-hl	IV	V	.	.	.	.	.	.	.	.
Vicia tenuifolia	-hl	IV	III	.	.	.	.	.	.	+	.
Viola arenaria	-hl	III	II	.	.	.	.	.	.	.	.
Lathyrus humilis	-hl	III	II	.	.	.	.	.	.	.	.
Verbascum nigrum	-hl	.	II	III	II	.	.	II	.	.	.
Alchemilla sp.	-hl	.	.	I	II	.	.	.	I	I	V^2
Calamagrostis epigeios	-hl	I	II	I	I	II	.	III^2	.	.	.
Kadenia dubia	-hl	II	+	.	I	.	.	II	.	.	.
Galium mollugo	-hl	II	+	.	II	.	.	I	.	.	.
Poa urssulensis	-hl	II	II	.	.	.	.	.	.	.	.
Crepis sibirica	-hl	II	.	I	II	.	.	I	II	I	I
Platanthera bifolia	-hl	II	.	I	+	.	.	.	II	+	.
Chamaenerion angustifolium	-hl	II	+	+	+	.	.	I	.	r	.
Epipactis helleborine	-hl	II	I	.	.	r	.	II	.	II	.
Anemone sylvestris	-hl	.	II	.	.	.	.	II	.	.	.
Adonis vernalis	-hl	.	II	.	.	.	.	II	.	.	.
Rumex thyrsiflorus	-hl	I	II	+	.	.	.	.	.	.	.
Amoria montana	-hl	.	II	+	II	.	.	.	.	.	.
Euphorbia discolor	-hl	.	II	.	.	.	.	.	.	.	.
Astragalus danicus	-hl	.	II	.	.	.	.	I	.	.	.
Artemisia vulgaris	-hl	.	II	.	.	.	.	.	.	.	.

Table VI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Vincetoxicum hirundinaria	-hl	.	II	+	.	.	.	.	.	.	.
Quercus robur	-t2	.	.	II	I	.	.	I	.	.	.
Agrostis tenuis	-hl	.	.	II	II	.	.	.	.	I	II
Hypericum perforatum	-hl	.	.	II	II	.	.	.	.	.	.
Fallopia convolvulus	-hl	.	.	II	II	.	.	I	.	.	.
Moehringia trinervia	-hl	.	.	II	I	+	.	.	.	.	.
Senecio jacobaea	-hl	.	+	II	.	.	.	I	.	.	.
Inula aspera	-hl	.	.	II	+	.	.	.	.	.	.
Potentilla goldbachii	-hl	.	.	II	+	.	.	I	.	.	.
Trifolium pratense	-hl	.	.	I	II	.	II	I	.	+	.
Phleum pratense	-hl	.	.	+	II	.	.	.	.	.	.
Taraxacum officinale	-hl	.	.	.	II	.	.	I	.	.	I
Anthriscus sylvestris	-hl	.	.	.	II	.	.	.	+	.	.
Leucanthemum vulgare	-hl	.	I	.	II	.	.	.	r	I	I
Rhinanthus minor	-hl	.	II	.	II	.	.	.	.	.	.
Lysimachia vulgaris	-hl	.	.	+	II	.	.	.	.	.	.
Plantago media	-hl	.	.	I	II	.	.	.	.	.	.
Campanula trachelium	-hl	.	.	I	II	.	.	I	.	r	.
Euphorbia subtilis	-hl	.	.	I	II	.	.	II	.	.	.
Poa sibirica	-hl	.	.	I	II	I	.	I	.	.	.
Echinops ruthenicus	-hl	.	.	.	.	II	.	.	.	.	.
Melampyrum cristatum	-hl	.	.	+	+	II	.	.	.	r	.
Sedum hybridum	-hl	.	.	+	+	II	.	I	.	.	.
Scutellaria supina	-hl	.	.	.	.	II	.	.	.	.	.
Polygonatum multiflorum	-hl	.	.	.	.	.	II	.	.	.	.
Adonis sibirica	-hl	.	.	.	.	.	II	.	+	II	.
Brachypodium sylvaticum	-hl	.	.	.	.	.	II	.	.	.	.
Spiraea crenata	-s1	.	.	.	.	.	II	.	.	.	.
Arctium tomentosum	-hl	.	.	.	+	.	.	II	.	.	.
Cynoglossum officinale	-hl	.	.	I	+	.	.	II	.	.	.
Galium album	-hl	.	.	.	I	.	.	II	.	.	.
Eryngium planum	-hl	.	+	.	.	.	.	II	.	.	.
Campanula wolgensis	-hl	.	I	.	.	.	.	II	.	.	.
Chaerophyllum prescotti	-hl	.	.	+	.	.	.	II	.	.	.
Artemisia absinthium	-hl	.	.	+	.	.	.	II	.	.	.
Xanthoselinum alsaticum	-hl	.	.	.	.	.	.	II	.	.	.
Carex supina	-hl	.	.	.	.	.	.	II	.	.	.
Iris sibirica	-hl	.	.	.	.	.	.	II	.	.	.
Silaum silaus	-hl	.	.	.	.	.	.	II	.	.	.
Veratrum lobelianum	-hl	.	.	.	.	.	.	.	II	.	+
Moneses uniflora	-hl	.	.	.	.	.	.	.	II	I	.
Goodyera repens	-hl	.	.	.	.	.	.	.	II	r	.
Euphorbia semivillosa	-hl	.	.	.	.	.	.	II	.	.	.
Artemisia pontica	-hl	.	.	.	.	.	.	II	.	.	.
Vicia sylvatica	-hl	I	.	.	I	.	.	.	+	II	.
Adoxa moschatellina	-hl	.	.	.	.	.	.	.	.	r	II
Geum rivale	-hl	.	.	.	I	.	.	.	.	.	II
Valeriana officinalis	-hl	.	.	.	.	r	.	.	+	+	II
Daphne mezereum	-hl	.	.	.	.	.	.	.	+	+	II
Lonicera xylosteum	-s1	.	.	.	.	.	.	.	.	.	II
Pinus sylvestris	-hl	.	.	.	.	.	.	.	.	.	II
Urtica dioica	-hl	.	I	.	I	.	.	.	.	.	II
Bryophytes and lichens:											
Pleurozium schreberi	-ml	II	II	IV	IV	V	II	.	III[2]	II	III
Hypnum pallescens	-ml	V	V[2]	IV	V	+	.	V	.	.	.
Brachythecium salebrosum	-ml	IV	II	III	V	+	.	III	.	r	.
Pylaisiella polyantha	-ml	V	III	I	II	.	.	IV	.	.	.
Sanionia uncinata	-ml	V	V	I	II	IV	.	I	r	.	.
Amblystegium serpens	-ml	II	III	I	II	r	.	III	r	r	.
Brachythecium oedipodium	-ml	.	.	III	III	.	.	.	.	.	.
Pohlia nutans	-ml	II	I	III	V	.	.	.	.	.	+
Cladonia sp.	-ml	.	.	.	.	V	I	.	.	.	.
Evernia mesomorpha	-ml	.	.	.	.	V	.	.	.	.	.
Hypogymnia physodes	-ml	.	.	.	.	V	.	.	.	.	.

Table VI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Hypogymnia tubulosa	-ml	.	.	.	.	V	.	.	.	.	.
Parmelia sulcata	-ml	.	.	.	.	V	.	.	.	.	.
Parmeliopsis ambigua	-ml	.	.	.	.	V	.	.	.	.	.
Melanelia olivacea	-ml	.	.	.	.	V	.	.	.	.	.
Pseudevernia furfuracea	-ml	.	.	.	.	V	.	.	.	.	.
Usnea hirta	-ml	.	.	.	.	V	.	.	.	.	.
Vulpicidia pinastri	-ml	.	.	I	II	V	.	.	.	.	.
Bryoria sp.	-ml	.	.	.	.	IV	.	.	.	.	.
Dicranum sp.	-ml	.	.	.	.	IV	.	.	+	.	.
Eurhynchium sp.	-ml	.	.	.	.	.	.	.	II	II	IV
Callicladium haldanianum	-ml	III	I	.	+	r	.	I	.	.	.
Plagiomnium cuspidatum	-ml	III	+	.	II	.	.	II	+	I	I
Platygyrium repens	-ml	III	II	.	.	.	.	.	.	.	.
Ptilidium pulcherrimum	-ml	III	II	+	II	+	.	I	.	.	.
Orthodicranum montanum	-ml	II	II	III	III	r	.	I	.	.	.
Cladonia cenotea	-ml	.	.	III	I	.	.	.	.	.	.
Cladonia chlorophaea	-ml	.	.	III	III	.	.	.	.	.	.
Cladonia coniocraea	-ml	.	.	II	III	.	.	.	.	.	.
Dicranum polysetum	-ml	.	.	II	III	II	.	.	.	.	.
Brachythecium rutabulum	-ml	.	.	.	.	.	III	.	.	.	.
Ceratodon purpureus	-ml	.	.	I	+	r	.	III	.	.	.
Rhodobryum roseum	-ml	.	.	.	+	.	.	.	II	I	III
Abietinella abietina	-ml	II	II	I	I	r	I	I	.	.	.
Amblystegium varium	-ml	II	II	+	.	.	.	.	.	.	.
Brachythecium reflexum	-ml	II	II	II	I	r	.	II	.	.	.
Dicranum fuscescens	-ml	II	.	.	+	.	.	.	.	I	+
Brachythecium starkei	-ml	II	+	.	+	.	.	.	.	.	.
Brachythecium velutinum	-ml	.	.	I	II	r	.	.	.	.	.
Polytrichum juniperinum	-ml	.	.	.	II	.	.	.	.	.	.
Tortula ruralis	-ml	.	.	+	II	r	.	.	.	.	.
Hylocomium splendens	-ml	.	.	I	+	II	I	.	II	I	.
Rhytidiadelphus loreus	-ml	.	.	.	.	.	II	.	.	.	.

Table VI (continuation)

Species with few occurrences:

Acer platanoides (t2) - 3(+), *Acer tataricum* (t3) - 6(I), *Actaea spicata* (hl) - 10(I), *Adonis wolgensis* (hl) - 7(I), *Allium lineare* (hl) - 2(I), *Alopecurus pratensis* (hl) - 5(+), 7(I), *Amoria repens* (hl) - 3(I), 4(+), 10(I), *Anemonastrum biarmiens* (hl) - 8(+), *Asparagus officinalis* (hl) - 7(I), *Atragene sibirica* (hl) - 6(I), 8(I), 9(I), *Aulacomnium palustre* (ml) - 4(+), *Barbarea vulgaris* (hl) - 3(+), 4(+), *Berteroa incana* (hl) - 7(I), *Brachythecium mildeanum* (ml) - 4(+), *Bryum pseudotriquetrum* (ml) - 7(I), *Bryum* sp. (ml) - 7(I), *Cacalia hastata* (hl) - 8(r), *Calamagrosti glomerata* (hl) - 2(+), *Campanula cervicaria* (hl) - 3(+), *Campanula rotundifolia* (hl) - 5(r), *Campylium hispidulum* (ml) - 9(r), *Campylium stellatum* (ml) - 10(+), *Carex contigua* (hl) - 3(I), 4(I), *Carex montana* (hl) - 8(r), 9(r), *Carex muricata* (hl) - 3(+), 4(I), 8(I), 9(r), *Carex pallescens* (hl) - 2(+), 8(+), *Carex polyphylla* (hl) - 3(I), 4(I), 9(r), *Carex* sp. (hl) - 7(I), *Carex sylvatica* (hl) - 8(+), *Carex vaginata* (hl) - 7(I), *Carlina biebersteinii* (hl) - 2(+), 5(+), 9(r), *Carum carvi* (hl) - 4(+), *Centaurea scabiosa* (hl) - 2(+), 7(I), *Centaurea stenolepis* (hl) - 4(+), *Cerastium arvense* (hl) - 2(+), *Cerastium holosteoides* (hl) - 4(+), 7(I), 10(+), *Chenopodium album* (hl) - 3(+), *Chenopodium hybridum* (hl) - 3(+), *Chrysaspis aurea* (hl) - 4(I), *Cirsium setosum* (hl) - 2(I), 4(+), *Cirsium vulgare* (hl) - 4(I), *Cladonia arbuscula* (ml) - 3(I), *Cladonia cornuta* (ml) - 3(+), *Cladonia deformis* (ml) - 3(+), *Cladonia fimbriata* (ml) - 3(I), 4(I), *Cladonia mitis* (ml) - 6(I), *Cladonia portentosa* (ml) - 3(+), *Cladonia rangiferina* (ml) - 3(+), 6(I), *Cladonia rei* (ml) - 3(I), *Climacium dendroides* (ml) - 8(r), *Climacium dendroides* (ml) - 4(+), 10(+), *Cotoneaster* sp. (s1) - 6(I), *Cypripedium macranthon* (hl) - 1(I), 2(+), *Delphinium dictyocarpum* (hl) - 7(I), *Deschampsia cespitosa* (hl) - 10(+), *Dicranum congestum* (ml) - 1(I), *Dicranum viride* (ml) - 4(+), *Draba sibirica* (hl) - 3(I), 5(r), *Dryopteris expansa* (hl) - 10(+), *Dryopteris filix-mas* (hl) - 10(+), *Eleocharis ovata* (hl) - 4(+), *Equisetum sylvaticum* (hl) - 8(+), *Erigeron acris* (hl) - 3(+), 4(+), *Erysimum cheiranthoides* (hl) - 4(+), *Euphrasia pectinata* (hl) - 5(r), *Fallopia* sp. (hl) - 7(I), *Festuca gigantea* (hl) - 9(r), *Festuca pseudodalmatica* (hl) - 7(I), *Festuca pseudosulcata* (hl) - 1(I), *Festuca valesiaca* (hl) - 6(I), *Filago vulgaris* (hl) - 7(I), *Galatella angustissima* (hl) - 7(I), *Galatella trinervifolia* (hl) - 5(I), *Galium aparine* (hl) - 10(+), *Galium physocarpum* (hl) - 4(+), 7(I), *Galium rivale* (hl) - 3(+), 4(+), *Gentiana cruciata* (hl) - 4(I), 7(I), *Geranium pratense* (hl) - 2(+), 4(I), *Geum aleppicum* (hl) - 1(I), 2(+), *Grimmia pulvinata* (ml) - 4(+), *Gypsophila altissima* (hl) - 7(I), *Hedwigia ciliata* (ml) - 3(+), *Helictotrichon desertorum* (hl) - 5(+), *Helictotrichon schellianum* (hl) - 2(+), 5(I), *Hieracium echioides* (hl) - 4(+), *Hieracium krylovii* (hl) - 8(+), *Hieracium onegense* (hl) - 10(I), *Hieracium pseuderectum* (hl) - 5(+), *Hieracium sp.* (hl) - 2(+), *Hieracium suberectum* (hl) - 3(+), 4(+), *Hylotelephium stepposum* (hl) - 7(I), *Hypericum hirsutum* (hl) - 4(+), 5(+), *Hypopitys monotropa* (hl) - 8(I), 9(+), *Inula britannica* (hl) - 1(I), 2(+), 4(+), *Inula* sp. (hl) - 4(+), *Juniperus communis* (s1) - 5(I), *Jurinea cyanoides* (hl) - 9(+), *Knautia arvensis* (hl) - 1(I), 7(I), *Lactuca serriola* (hl) - 3(+), *Lappula squarrosa* (hl) - 7(I), *Lathyrus litvinovii* (hl) - 7(I), *Lathyrus* sp. (hl) - 7(I), *Leontodon autumnalis* (ml) - 10(+), *Leonurus quinquelobata* (hl) - 4(+), 7(I), *Linaria ruthenica* (hl) - 3(+), *Lithospermum officinalis* (hl) - 2(+), *Lophocolea heterophylla* (ml) - 1(I), 2(+), 5(r), *Lophozia longidens* (ml) - 1(I), *Lophozia ventricosa* (ml) - 3(+), *Luzula multiflora* (hl) - 4(+), 7(I), *Matteuccia struthiopteris* (hl) - 10(+), *Medicago falcata* (hl) - 2(I), *Medicago romanica* (hl) - 7(I), *Melampyrum sylvaticum* (hl) - 9(r), *Melandrium album* (hl) - 2(I), 3(+), 7(I), *Myosotis ramosissima* (hl) - 3(I), *Oberna behen* (hl) - 5(r), *Onosma simplicissima* (hl) - 5(+), *Orthodicranum flagellare* (ml) - 5(r), *Orthotrichum speciosum* (ml) - 1(I), 3(+), *Padus avium* (t2) - 4(+), *Parmelia saxatilis* (ml) - 5(r), *Parmeliopsis hyperopta* (ml) - 5(+), *Pedicularis incarnata* (hl) - 1(I), *Pedicularis uralensis* (hl) - 5(I), *Peltigera canina* (ml) - 3(+), *Peltigera polydactyla* (ml) - 3(+), *Peltigera species* (ml) - 5(r), *Phragmites australis* (hl) - 7(I), *Picea obovata* (t1) -8(I), *Plagiomnium elatum* (ml) - 4(+), *Plagiomnium medium* (ml) - 8(+), 9(r), *Plagiothecium laetum* (ml) - 4(+), 10(+), *Plantago lanceolata* (hl) - 9(r), *Plantago major* (hl) - 3(+), 4(+), 9(+), 10(+), *Plantago maxima* (hl) - 7(I), *Plantago* sp. (hl) - 1(I), 2(+), *Poa lapponica* (hl) - 5(r), *Poa palustris* (hl) - 2(+), *Poa trivialis* (hl) - 7(I), *Pohlia cruda* (ml) - 3(+), *Polemonium coeruleum* (hl) - 2(+), 3(+), 4(I), 8(r), 9(r), 10(I), *Polygala comosa* (hl) - 5(I), *Polytrichum* sp. (ml) - 5(I), *Potentilla argentea* (hl) - 2(+), *Potentilla humifusa* (hl) - 2(+), 3(+), 4(+), 5(I), *Potentilla impolita* (hl) - 3(I), *Potentilla longipes* (hl) - 7(I), *Primula abchasica* (hl) - 7(I), *Psammophilie muralis* (hl) - 3(+), *Pyrola rotundifolia* (hl) - 9(+), 10(I), *Quercus robur* (t1) -3(+), 4(+), 7(I), *Radula complanata* (ml) - 3(+), *Ranunculus repens* (hl) - 8(r), 10(+), *Rhamnus cathartica* (s1) - 4(+), *Rhinanthus serotinus* (hl) - 3(+), *Ribes nigrum* (s1) - 6(I), *Rumex acetosa* (hl) - 3(+), 4(+), 9(+), *Rumex confertus* (hl) - 1(I), *Salix bebbiana* (sl) - 2(+), *Salix caprea* (s1) - 8(r), *Salix caprea* (t2) - 3(+), *Salix caprea* (hl) - 10(I), *Salvia stepposa* (hl) - 7(I), *Schistidium apocarpum* (ml) - 5(r), *Sempervivum pumilum* (hl) - 9(r), *Stellaria media* (hl) - 9(r), *Stellaria nemorum* (hl) - 10(+), *Stipa pennata* (hl) - 3(+), *Thalictrum foetidum* (hl) - 5(+), *Thymus marschallianus* (hl) - 7(I), *Thymus serpyllum* (hl) - 2(+), *Tilia cordata* (t1) -3(+), *Tilia cordata* (t2) - 3(I), 4(+), *Tragopogon podolicus* (hl) - 5(r), *Tripleurospermum perforatum* (hl) - 4(+), *Trollius asiaticus* (hl) - 2(+), *Vaccinium myrtillus* (hl) - 5(r), *Valeriana dubia* (hl) - 5(r), *Verbascum lychnitis* (hl) - 3(I), 4(+), *Verbascum thapsus* (hl) - 5(r), *Veronica prostrata* (hl) - 7(I), *Viburnum opulus* (hl) - 10(+), *Vicia pisiformis* (hl) - 3(+), *Vincetoxicum albowianum* (hl) - 5(I), *Viola ambigua* (hl) - 9(r), *Viola nemausensis* (hl) - 7(I), *Viola* sp. (hl) - 6(I), 7(I).

Table VII — Order *Calamagrostio epigei-Betuletalia pendulae*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mean altitude (m)		120	206	250	255	190	200	200	200	240	245	110	110	110	110	200
Mean cover of tree layer %		70	62	61	59	57	63	62	60	62	60	62	60	49	58	56
Mean cover of shrub layer (%)		4	3	5	4	43	23	11	2	1	3	5	3	3	3	2
Mean cover of herb layer (%)		58	64	67	71	48	58	66	52	63	70	59	53	66	64	68
Mean cover of moss layer (%)		0	0	0	0	+	3	8	5	3	1	0	0	0	0	0
Mean heigt of tree layer (m)		20	23	19	22	20	23	23	20	20	22	20	19	19	21	20
Mean heigh of shrub layer (cm)		41	40	43	46	46	110	115	47	49	58	44	58	56	56	72
Mean height of herb layer (cm)		34	38	38	42	34	30	46	34	47	52	39	58	52	54	64
Mean number of species in one relevé		36	44	53	52	51	36	50	40	51	52	40	31	36	38	34
Relevé area		Everywhere 200 m^2														
Number of species		121	103	122	88	101	70	103	94	110	95	104	119	93	85	93
Number of relevés		15	9	15	8	12	6	11	7	9	7	9	18	10	8	6
The main species of tree layer																
Betula pendula	-t1	V^4	V^4	V^4	V^4	V^4	V^2	V^2	V^3	V^2	V^3	V^4	V^4	V^4	V^4	V^4
Populus tremula	-t1	III^3	IV^2	II^2	II	II^2	III	.	III	II	III^2	II^2	III^2	V^2	IV^3	IV^3
Pinus sylvestris	-t1	.	.	.	.	.	V^4	V^3	V^3	V^4	.	.	.	.	.	.
D.S. Ass. ***Peucedano morisonii-Betuletum pendulae*** = D.S. All. ***Peucedano morisonii-Betulion pendulae***																
Filipendula vulgaris	-hl	IV	V	IV	V	V	II	V	V	V	IV	II	.	.	.	.
Origanum vulgare	-hl	I	I	II	V	III	III	IV	III	V	III	.	.	+	III	.
Ranunculus polyanthemos	-hl	III	II	III	IV	III	I	III	III	IV	III	II	I	.	.	I
Artemisia latifolia	-hl	I	III	IV	V	III	II	V	.	III	III	I	+	I	V	I
Seseli libanotis	-hl	III	V	V^2	V	V^2	I	III	I	II	IV^2	II	I	.	IV	.
Anemone sylvestris	-hl	II	II	III	II	IV	I	.	IV	.	II	.	+	.	II	.
Filipendula stepposa	-hl	II	V	V	IV	IV	.	.	III	.	III	.	.	.	.	.
Phlomoides tuberosa	-hl	III	V	V	IV	IV	IV	I	.	.	IV	II	II	.	II	.
Fragaria viridis	-hl	III	V^2	IV^2	IV^2	II	V	III	.	I	.	I	I	.	I	.
Polygonatum odoratum	-hl	I	.	I	V	V	V	V	V	V	IV	.	+	.	.	III
Carex praecox	-hl	I	IV	IV	V	V	V^2	III	I	.	I	.	+	.	.	.
Galium verum	-hl	V	V	V	IV	IV	IV	.	.	.	.	II	I	.	II	.
Helictotrichon pubescens	-hl	+	II	III	III	.	III	III	.	.	.	.	.	.	.	.
Plantago urvillei	-hl	II	IV	IV	IV	+	.	.	II	.	.	.	.	.	.	.
Dracocephalum ruyschiana	-hl	+	.	I	V	III	I	V	III	V	II	.	.	.	.	.
Peucedanum morisonii	-hl	IV	II	III	II	.	II	II	.	I	.	.	+	.	.	.
D.S. Subass. ***P.m.-B.p. geranietosum pratensis***																
Geranium pratense	-hl	I	V	IV	.	+	I	.	.	.	.	IV	III	+	.	III
Potentilla chrysantha	-hl	.	IV	I	I	.	.	.	.	.	.	.	.	.	.	.
Delphinium retropilosum	-hl	.	III	.	I	.	III	+	.	.	.	.	.	.	.	.
Eryngium planum	-hl	I	III	I	.	II	.	.	.	.	.	.	+	.	.	.
D.S. Ass. ***Carici praecocis-Betuletum pendulae***																
Silene nutans	-hl	+	I	IV	V	V	.	IV	I	.	II	.	.	.	.	I
Carex caryophyllea	-hl	I	I	IV	V	IV	.	I	.	.	II	II	.	.	II	.
Medicago falcata	-hl	I	I	III	IV	III	.	.	.	.	II	.	.	.	.	.
Artemisia sericea	-hl	.	.	II	IV	III	.	.	.	.	.	.	.	.	.	.
Festuca pseudovina	-hl	.	.	IV	.	V^2	.	.	III	.	.	.	.	.	.	.
D.S. Subass. ***C.p.-B.p. vicietosum unijugae***																
Astragalus danicus	-hl	.	II	II	IV	I	II	I	I	I	I	.	.	.	.	.
Viola persicifolia	-hl	.	I	.	IV	.	.	.	.	.	.	.	.	.	.	.
Vicia unijuga	-hl	.	.	.	IV	.	.	II	.	V	.	.	.	.	.	.
Adenophora liliifolia	-hl	I	.	II	III	.	.	+	.	I	.	.	.	.	I	.
D.S. Subass. ***C.p.-B.p. cerasetosum fruticosae***																
Trifolium medium	-hl	.	.	.	.	V	.	.	.	.	.	.	.	.	.	.
Cerasus fruticosa	-s1	.	.	.	.	V^3	.	.	.	.	.	.	.	.	.	.
Artemisia armeniaca	-hl	.	.	II	.	IV	.	.	.	.	III	.	I	.	.	I
Centaurea scabiosa	-hl	.	.	II	I	IV	.	.	.	.	.	.	.	.	.	.
Galium tinctorium	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Adonis vernalis	-hl	I	.	I	.	III	.	.	.	.	.	.	.	.	.	.
Euphorbia virgata	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.

Table VII (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
D.S. Ass. ***Caragano arborescentis-Pinetum sylvestris***																
Neottianthe cucullata	-hl	.	.	.	.	.	III	+	I	II	.	.	.	.	.	.
Poa nemoralis	-hl	.	I	+	.	.	III	.	.	I	.	.	.	.	.	II
D.S. Ass. ***Equiseto hyemalis-Pinetum sylvestris***																
Fragaria vesca	-hl	I	.	I	.	V^2	.	V^2	V^2	V^2	.	.	.	.	.	II
Geranium sylvaticum	-hl	.	.	+	.	.	.	V	V	V	II	.	.	.	.	III
Vaccinium vitis-idaea	-hl	.	.	.	.	.	.	V^2	V^2	V^2	.	.	.	.	.	.
Lathyrus vernus	-hl	.	.	.	IV^2	.	.	V^2	V^2	V^2	V^2	.	+	+	I	V^2
Maianthemum bifolium	-hl	.	.	.	.	.	.	III	V	IV	V	.	+	.	.	III
Orthilia secunda	-hl	I	.	+	.	.	I	III	V	V	.	I	.	.	.	.
Equisetum hyemale	-hl	.	.	.	.	.	II	+	III	IV	.	.	.	.	.	.
Pteridium aquilinum	-hl	.	.	.	I	.	.	I	I	IV^2	V^3	.	II	.	.	III^4
Crepis praemorsa	-hl	.	.	II	.	II	.	.	IV	II	IV	.	.	.	.	II
D.S. Subass. ***E.h.-P.s. caraganetosum arborescentis***																
Caragana arborescens	-s1	I	.	I	II	.	V^3	V^2	.	II	.	.	.	.	.	.
D.S. Subass. ***E.h.-P.s. chimaphiletosum***																
Potentilla erecta	-hl	.	.	+	.	.	.	.	V	.	.	.	.	.	.	.
Chimaphila umbellata	-hl	.	.	.	.	.	.	.	IV	I	.	.	.	.	.	.
Pyrola rotundifolia	-hl	.	.	.	.	.	.	.	III	.	.	.	.	.	.	I
Carex vaginata	-hl	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.
Knautia arvensis	-hl	I	.	.	.	.	.	.	III	I	.	.	.	.	.	.
Platanthera bifolia	-hl	.	.	.	.	.	II	+	III	I	II	.	.	.	.	II
D.S. Subass. ***E.h.-P.s. caricetosum macrourae***																
Carex macroura	-hl	.	.	.	.	.	.	I	.	V^2	.	.	.	.	.	.
Vaccinium myrtillus	-hl	.	.	.	.	.	.	.	.	IV^2	.	.	.	.	.	.
Heracleum dissectum	-hl	.	.	.	.	.	.	.	.	IV	.	.	.	.	.	.
Bupleurum aureum	-hl	.	.	.	.	.	.	.	.	IV	.	.	.	.	.	.
Potentilla fragarioides	-hl	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.
Veronica chamaedrys	-hl	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.
Athyrium filix-femina	-hl	.	.	.	.	.	.	+	.	III	.	.	.	.	.	.
D.S. Subass. ***E.h.-P.s. betuletosum pendulae***																
Thalictrum foetidum	-hl	.	.	.	.	.	.	.	.	.	V	.	+	.	.	I
Viola mirabilis	-hl	+	.	.	.	I	.	.	.	.	IV	.	.	+	I	II
Cypripedium guttatum	-hl	.	.	.	.	.	.	.	.	II	III	.	.	.	.	I
Silaum silaus	-hl	+	.	II	.	II	.	.	.	.	III	.	I	.	.	.
Polygonatum humile	-hl	+	.	.	I	.	.	+	.	II	III	I	.	.	.	II
D.S. Ass. ***Poo urssulensis-Betuletum pendulae***																
Poa urssulensis	-hl	II	II	III	III	+	.	III	.	.	.	V	I	.	I	.
Veronica longifolia	-hl	II	I	.	.	+	.	.	.	.	.	IV	II	+	.	.
D.S. Ass. ***Phalaroido-Betuletum pendulae***																
Phalaroides arundinacea	-hl	.	.	.	.	.	.	.	.	.	I	II	V^2	I	.	.
Calamagrostis canescens	-hl	+	.	.	.	.	.	.	.	.	.	I	IV^2	+	.	.
Ptarmica cartilaginea	-hl	.	.	.	.	.	.	.	.	.	.	II	III	.	.	.
Carex riparia	-hl	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.
Poa palustris	-hl	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.
D.S. Ass. ***Cirsio heterophylli-Betuletum pendulae***																
Cirsium heterophyllum	-hl	.	.	.	.	.	.	.	IV	I	.	I	+	IV	IV	IV
Cirsium setosum	-hl	I	III	I	II	+	I	II	II	.	II	II	II	III	V	II
Phragmites australis	-hl	.	.	.	.	.	.	.	.	.	I	I	I	III	V	IV
Viola hirta	-hl	I	.	.	III	+	.	I	.	II	.	.	.	IV	V	III
Cacalia hastata	-hl	.	.	.	.	.	.	.	.	I	IV	.	+	III	IV	V
D.S. Subass. ***C.h.-B.p. aegopodietosum***																
Aegopodium podagraria	-hl	.	.	.	.	.	.	.	.	.	.	.	.	V^2	II	II
Equisetum pratense	-hl	.	.	.	.	.	.	II	IV	IV^2	II	II	I	IV	I	V

Table VII (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
D.S. Subass. ***C.h.-B.p. galeopsietosum***																
Galeopsis bifida	-hl	.	.	.	.	.	II	.	.	.	.	I	.	.	IV	.
D.S. Subass. ***C.h.-B.p. vicietosum sylvaticae***																
Equisetum sylvaticum	-hl	.	.	.	.	.	.	.	.	.	.	.	+	+	.	V²
Vicia sylvatica	-hl	.	.	.	.	.	.	.	.	II	III	.	+	+	.	V²
Paris quadrifolia	-hl	.	.	.	.	.	.	.	.	.	.	.	+	+	.	IV
Cypripedium macranthon	-hl	.	.	.	.	.	.	.	II	I	III	.	.	+	I	III
Viburnum opulus	-s1	.	.	.	.	.	.	II	III	III	I	.	.	+	.	III
D.S. All. ***Calamagrostio epigei-Betulion pendulae***																
Filipendula ulmaria	-hl	III	I	+	.	.	.	.	III	.	II	V	V	IV²	IV	V
Lysimachia vulgaris	-hl	.	I	.	.	.	.	.	III	.	IV	IV	V	III	III	V
Inula britannica	-hl	I	II	.	.	.	.	.	.	.	.	III	I	+	III	.
Betula pubescens	-t1	.	.	.	.	.	.	.	.	.	.	III²	V²	+	II	III
Agrostis gigantea	-hl	.	.	.	.	.	.	.	.	.	.	III	+	III²	II	.
Moehringia lateriflora	-hl	.	.	+	.	.	.	II	.	.	I	IV	II	III	II	III
Crepis sibirica	-hl	I	.	.	I	.	.	.	.	II	V	III²	III	II	II	IV²
D.S. Ord. ***Calamagrostio epigei-Betuletalia pendulae***																
Calamagrostis epigeios	-hl	V²	V²	V	IV²	V²	V	III	V	II	III	V	V²	IV²	V	II
Kadenia dubia	-hl	V	V	V	V	IV	V	V	V	V	I	IV	IV	II	IV	II
Poa angustifolia	-hl	V²	V²	V²	IV	V	III	V	I	II	I	IV	III	III	IV²	.
Artemisia macrantha	-hl	IV	V	V	V	V	V	IV	I	III	III	III	IV	II	IV	I
Geranium bifolium	-hl	III	.	V	V	.	I	V	.	V	V	IV	III	IV	V	IV
Heracleum sibiricum	-hl	V	IV	II²	IV	IV	.	II	III	.	V	V	IV	II	II	V
Galatella biflora	-hl	III	IV	V	V	III	.	I	.	.	V	IV	IV	.	IV	I
D.S. Cl. ***Brachypodio pinnati-Betuletea pendulae***																
Brachypodium pinnatum	-hl	IV²	IV²	IV²	V²	IV²	V	V²	V²	V²	V²	IV²	III²	V²	V²	III²
Iris ruthenica	-hl	III²	V²	III²	V²	.	V²	V²	.	V²	.	IV²	II	III	V²	.
Rubus saxatilis	-hl	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²	V²
Serratula coronata	-hl	IV	IV	V	V	IV	.	III	V	II	IV	IV	V	IV	V	IV
Pulmonaria mollis	-hl	II	I	IV	V	I	V	V	V	V	V	IV	III	III	V	V²
Vicia sepium	-hl	II	IV	IV	V	II	III	V	V	V	V	V	IV	V	V	V
Agrimonia pilosa	-hl	II	II	II	I	II	IV	V	III	IV	II	II	I	II	I	IV
Hieracium umbellatum	-hl	IV	II	V	IV	IV	.	.	I	II	V²	III	IV	III	II	III
Angelica sylvestris	-hl	I	.	+	III	+	I	III	II	IV	III	IV	IV	III	IV	III
Lilium pilosiusculum	-hl	I	.	I	II	.	.	V	II	V	III	II	.	II	I	II
Pleurospermum uralense	-hl	I	.	.	IV	I	.	V	.	IV	IV	IV	II	II	III	IV
Calamagrostis arundinacea	-hl	I	.	II	.	IV²	.	V²	V²	V²	V²	.	+	III²	II	III²
D.S. Cl. ***Molinio-Arrhenatheretea***																
Galium boreale	-hl	V	V	V	IV	IV	V	V	V	V	III	V	V	V	V	III
Vicia cracca	-hl	V	V	V	V	V	II	V	III	II	V	V	IV	IV	V	I
Lathyrus pratensis	-hl	III	V	IV	V	III	III	IV	II	III	III	IV	IV	V	IV	I
Achillea millefolium	-hl	II	III	V	V	V	II	IV	IV	II	V	IV	IV	IV	III	III
Sanguisorba officinalis	-hl	III	V	IV	IV	III	I	II	V	V	III	III	IV	III	V	IV
Dactylis glomerata	-hl	+	III²	II	V²	.	IV	II	.	III	.	.	.	.	.	.
Trifolium pratense	-hl	I	.	II	I	.	.	.	.	.	.	II	I	III	II	.
Stellaria graminea	-hl	I	I	II	.	.	.	II	.	.	.	I	+	.	.	.
Alopecurus pratensis	-hl	.	II	I	.	.	.	.	.	.	.	.	.	I	I	.
Phleum pratense	-hl	.	.	.	.	.	.	.	.	.	.	I	.	I	.	I
Festuca pratensis	-hl	.	.	.	.	.	.	.	.	.	.	I	+	I	I	I
Other species																
Rosa acicularis	-s1	IV	II	I	II	.	I	I	.	.	.	V	III	III	IV	I
Thalictrum minus	-hl	III	V	III	V	II	V	IV	III	II	III	III	II	III	II	.
Solidago virgaurea	-hl	IV	II	V	IV	V	IV	II	V	V	V	I	II	II	II	II
Lathyrus pisiformis	-hl	IV	III²	IV	V	V	V	V	V	IV	V	II	I	III	IV	V
Lupinaster pentaphyllus	-hl	IV	IV	V	V	III	IV	V	III	V	V	IV	+	.	I	II
Viola montana	-hl	II	III	IV	I	+	V	III	IV	III	IV	IV	II	II	III	II
Hylotelephium triphyllum	-hl	II	III	II	IV	III	III	II	II	.	I	III	II	+	I	I
Tanacetum vulgare	-hl	V	IV	IV	IV	III	.	+	I	.	II	III	III	+	.	.
Inula salicina	-hl	III	.	IV	V	III²	.	III	V	V	V²	I	II	III	II	III

Table VII (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Rosa majalis	-s1	II	V	V	V	V	IV	V	V	IV	IV	.	II	+	.	II
Pleurozium schreberi	-ml	.	.	.	I	.	V	V^2	V	V	.	.	.	.	.	.
Urtica dioica	-hl	+	II	.	.	.	IV	+	.	.	.	I	+	II	.	II
Thalictrum simplex	-hl	III	II	I	.	III	.	.	II	I	IV	II	II	III	IV	IV
Elytrigia repens	-hl	III	II	II	.	IV	I	I	I	.	.	IV^2	III^2	.	II	I
Veronica spuria	-hl	I	IV	II	II	III	.	.	I	.	I	I	I	.	.	.
Populus tremula	-s1	.	IV	I	.	.	III	.	III	II	IV	.	.	.	.	IV
Pinus sylvestris	-s1	.	.	.	.	.	IV	III	III	III						
Asparagus officinalis	-hl	.	III	II	.	III	.	.	.	.	.	.	I	.	.	.
Artemisia vulgaris	-hl	II	II	I	II	I	I	+	.	.	II	II	I	III	II	II
Melandrium album	-hl	+	II	.	I	III	IV	I	.	.	.	II	.	.	.	.
Trommsdorfia maculata	-hl	II	I	III	.	.	.	.	.	II	II	I	.	.	.	.
Betula pendula	-s1	.	II	II	I	.	.	III	II	.	.	.	.	.	.	I
Campanula glomerata	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Viola arenaria	-hl	I	II	II	I	II	.	III	I	II	I	.	.	.	.	.
Carex ericetorum	-hl	.	.	.	.	.	I	III	II	.	.	.	.	.	.	.
Glechoma hederacea	-hl	I	I	.	.	+	.	III	II	.	.	.	+	.	.	III
Ptilium crista-castrensis	-ml	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.
Dryopteris expansa	-hl	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.
Salix caprea	-s1	.	.	II	I	+	.	.	.	IV	I	III	I	I	II	I
Lathyrus humilis	-hl	II	II	II	II	II	.	.	I	III	I	.	.	.	.	II
Padus avium	-s1	+	I	.	.	+	I	II	I	III	.	II	.	.	.	I
Melica nutans	-hl	.	.	.	.	.	.	V	.	II	.	.	.	.	I	.
Taraxacum officinale	-hl	.	II	I	.	.	.	.	.	.	.	III	.	.	.	.
Salix bebbiana	-s1	II	II	II	I	.	I	.	.	.	I	II	II	+	.	.
Achillea asiatica	-hl	II	.	.	.	.	.	.	.	.	.	.	+	.	I	.
Ribes nigrum	-s1	.	II	+	.	.	II	.	.	.	.	II	II	I	.	I
Spiraea hypericifolia	-s1	+	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Chaerophyllum prescotti	-hl	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Stellaria media	-hl	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Valeriana alternifolia	-hl	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Bromopsis inermis	-hl	+	II	I	I	I	I	I	.	.	.	.	+	.	.	.
Aconogonon alpinum	-hl	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Anthriscus sylvestris	-hl	.	II	.	.	.	.	.	.	.	.	.	+	.	.	.
Tephroseris integrifolius	-hl	.	II	.	.	.	.	+	.	.	.	.	.	.	.	.
Phleum phleoides	-hl	+	.	II	.	II	.	.	.	.	.	.	.	.	.	.
Geum aleppicum	-hl	.	I	II	.	.	.	II	.	II	.	II	.	I	I	I
Melilotoides platycarpos	-hl	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.
Carex tomentosa	-hl	+	.	I	.	II	.	.	.	.	I	.	.	.	.	.
Allium lineare	-hl	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Carex supina	-hl	+	.	I	.	.	II	.	.	.	.	.	.	.	.	.
Vicia tenuifolia	-hl	.	I	.	.	.	II	.	.	I	I	.	.	.	.	.
Pulsatilla patens	-hl	.	.	.	I	+	.	II	.	II	I	.	.	+	.	.
Veronica krylovii	-hl	.	I	.	.	.	.	II	.	.	.	.	.	.	.	.
Trollius europaeus	-hl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	II
Trientalis europaea	-hl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.
Pyrola chlorantha	-hl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.
Aconitum volubile	-hl	.	.	.	.	.	.	.	.	II	.	.	.	I	I	.
Cirsium serratuloides	-hl	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Astragalus glycyphyllos	-hl	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Pyrola incarnata	-hl	.	.	.	.	.	.	+	.	II	.	.	.	.	.	.
Vicia megalotropis	-hl	I	.	.	.	.	.	.	.	II	.	I	+	.	.	.
Silene repens	-hl	+	.	+	.	.	.	.	I	I	II	.	.	.	.	.
Ranunculus acris	-hl	.	.	.	.	.	.	.	.	.	II	.	+	.	.	.
Matricaria recutita	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.
Plantago major	-hl	.	.	+	.	.	.	.	.	.	.	II	I	.	.	.
Conioselinum tataricum	-hl	.	.	.	.	.	.	.	.	.	.	II	I	I	.	.
Festuca rubra	-hl	.	.	.	.	.	.	.	.	.	.	II	+	II	II	I
Rubus idaeus	-s1	.	.	.	.	+	.	+	.	.	.	II	.	.	I	.
Amoria repens	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.
Salix cinerea	-s1	.	.	.	.	.	.	.	.	.	.	I	II	II	I	.
Stachys palustris	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.
Carex cespitosa	-hl	.	I	.	.	.	.	.	.	.	.	.	II	+	.	.
Calamagrostis langsdorffii	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	I
Chamaenerion angustifolium	-hl	+	.	+	.	.	.	.	.	I	I	.	I	II	I	II

Table VII (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Galium uliginosum	-hl	.	.	.	.	.	.	.	.	.	.	I	.	II	I	.
Epilobium tetragonum	-hl	.	.	.	.	.	.	.	.	.	.	I	.	II	.	.
Trisetum sibiricum	-hl	.	.	.	.	.	.	.	.	.	.	.	+	II	II	.
Senecio nemorensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Carex pallescens	-hl	.	.	+	I	.	.	+	.	.	.	.	.	.	.	II

Species with few occurrences:

Adonis sibirica (hl) - 5(+), *Agrostis stolonifera* (hl) - 12(+), *Alchemilla* sp. (hl) - 2(I), *Angelica palustris* (hl) - 11(I), *A. tenuifolia* (hl) - 2(I), *Antennaria dioica* (hl) - 8(I), *Arctium tomentosum* (hl) - 15(I), *Artemisia dracunculus* (hl) - 1(+), *A. gmelinii* (hl) - 1(+), *A. laciniata* (hl) - 5(+), 11(I), 14(I), *A. pontica* (hl) - 1(I), 2(I), *A. tanacetifolia* (hl) - 1(+), *Bistorta major* (hl) - 1(+), 2(I), 3(I), 8(I), *Brachythecium salebrosum* (ml) - 1(+), *Campanula rotundifolia* (hl) - 5(+), *C. altaica* (hl) - 3(+), 4(I), *C. bononiensis* (hl) - 5(+), *C. cervicaria* (hl) - 12(+), *C. sibirica* (hl) - 13(+), *Carex atherodes* (hl) - 12(+), *C. duriuscula* (hl) - 3(+), *C. obtusata* (hl) - 1(+), 5(+), *Cenolophium denudatum* (hl) - 8(I), 11(I), 12(+), 14(I), *Centaurea sibirica* (hl) - 3(+), *Cirriphyllum piliferum* (ml) - 9(I), *Cirsium canum* (hl) - 11(I), 12(+), *Cotoneaster melanocarpus* (s1) - 3(+), 7(I), *Crataegus sanguinea* (s1) - 4(I), 5(+), 7(I), 9(I), 14(I), *Dactylorhiza fuchsii* (hl) - 8(I), *Delphinium elatum* (hl) - 13(+), *Dianthus superbus* (hl) - 6(I), 9(I), *Dicranum polysetum* (ml) - 8(I), 9(I), *Dicranum* sp. (ml) - 7(+), *Diphasiastrum complanatum* (hl) - 9(I), *Elymus caninus* (hl) - 9(I), 15(I), *Epipactis helleborine* (hl) - 9(I), 15(I), *Erigeron acris* (hl) - 11(I), *Euphorbia discolor* (hl) - 2(I), 3(+), 5(I), 7(+), 14(I), *Festuca valesiaca* (hl) - 3(+), *Filago vulgaris* (hl) - 8(I), *Frangula alnus* (s1) - 7(+), *Galatella macrosciadia* (hl) - 10(I), *Gentiana macrophylla* (hl) - 8(I), *G. pneumonanthe* (hl) - 13(+), *Glycyrrhiza uralensis* (hl) - 1(+), *Gypsophila altissima* (hl) - 1(+), *Helictotrichon schellianum* (hl) - 3(+), *Hesperis sibirica* (hl) - 3(+), 15(I), *Hieracium virosum* (hl) - 3(+), *Hordeum brevisubulatum* (hl) - 11(I), *Inula hirta* (hl) - 3(+), 5(+), *Iris sibirica* (hl) - 3(+), 12(I), *Lactuca sibirica* (hl) - 11(I), 12(+), 13(+), *Lathyrus palustris* (hl) - 12(I), *Leucanthemum vulgare* (hl) - 15(I), *Linaria vulgaris* (hl) - 1(I), 2(I), 3(I), 11(I), *Lithospermum officinale* (hl) - 2(I), *Luzula multiflora* (hl) - 8(I), 11(I), 15(I), *L. pallidula* (hl) - 3(I), *L. pilosa* (hl) - 13(+), *Melampyrum cristatum* (hl) - 1(I), *Milium effusum* (hl) - 9(I), *Myosotis suaveolens* (hl) - 3(+), *Oberna behen* (hl) - 3(+), 5(+), *Odontites vulgaris* (hl) - 11(I), *Oxytropis campanulata* (hl) - 6(I), *Pedicularis elata* (hl) - 13(I), *P. resupinata* (hl) - 12(+), 13(I), *Pimpinella saxifraga* (hl) - 1(I), 4(I), 13(+), *Plantago maxima* (hl) - 1(+), 12(I), *P. media* (hl) - 8(I), 13(+), 15(I), *Plagiomnium medium* (ml) - 12(+), *Polygala comosa* (hl) - 3(+), 12(+), *Potentilla canescens* (hl) - 2(I), *Prunella vulgaris* (hl) - 3(+), 15(I), *Ptarmica impatiens* (hl) - 9(I), 12(+), *Ranunculus monophyllus* (hl) - 1(+), 12(I), *R. propinquus* (hl) - 1(+), 2(I), *Ribes hispidulum* (s1) - 9(I), 11(I), *Rhytidiadelphus triquetrus* (ml) - 7(+), *Rubus humifusus* (hl) - 5(+), 8(I), *Rumex acetosella* (hl) - 2(I), 9(I), *R. confertus* (hl) - 1(+), *Salix dasyclados* (s1) - 13(+), 14(I), *S. rosmarinifolia* (s1) - 11(I), *Salvia stepposa* (hl) - 1(+), 3(+), *Scutellaria galericulata* (hl) - 7(+), *Silene armeria* (hl) - 5(+), *Sonchus arvensis* (hl) - 11(I), 12(+), *Sorbus sibirica* (s1) - 7(+), 9(I), *Spiraea media* (s1) - 9(I), *S. crenata* (s1) - 1(+), *Stellaria bungeana* (hl) - 6(I), 11(I), 12(+), *Tragopogon orientalis* (hl) - 2(I), *Tripleurospermum perforatum* (hl) - 1(+), *Turritis glabra* (hl) - 2(I), 5(+), *Valeriana officinalis* (hl) - 10(I), *Verbascum nigrum* (hl) - 1(I), *Veronica incana* (hl) - 3(+), *V. spicata* (hl) - 1(+), *V. teucrium* (hl) - 1(I), 10(I), *Vincetoxicum sibiricum* (hl) - 5(+), 10(I), 15(I), *Viola arvensis* (hl) - 1(+), *V. selkirkii* (hl) - 9(I).

Table VIII — Class *Querco-Fagetea*, order *Fagetalia sylvaticae*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Mean altitude (m)		-	407	520	470	405	455	630	590	407	-	200	400
Mean cover of tree layer %		57	60	55	70	77	55	58	70	62	80	60	65
Mean cover of shrub layer (%)		-	56	12	8	8	15	5	22	3	35	3	5
Mean cover of herb layer (%)		95	67	85	70	95	85	78	78	88	85	95	100
Mean cover of moss layer (%)		-	2	12	20	2	3	3	3	1	1	-	-
Mean heigt of tree layer (m)		-	21	23	22	25	23	23	22	21	-	24	23
Mean heigh of shrub layer (cm)		-	95	115	110	128	145	130	145	110	-	140	125
Mean height of herb layer (cm)		-	46	84	65	81	87	93	90	75	-	110	100
Mean number of species in one relevé		45	44	66	68	50	65	54	55	47	38	33	38
Relevé area (m^2)		100	200	200	200	200	200	200	200	200	200	200	200
Number of species		78	85	118	130	102	123	90	103	79	84	64	62
Number of relevés		9	7	9	8	10	10	9	5	7	8	14	6
The main species of tree layer													
Abies sibirica	-t1	V^3	V^3	V^4	V^4	III	V^4	V^4	V^2	.	III^2	.	II
Betula pendula	-t1	V	IV^2	IV	V	III^2	II	II	V^2	II	I	III^2	.
Pinus sibirica	-t1	V	IV	V^2	IV	+	II	.	V	.	III^2	.	.
Populus tremula	-t1	III	III^2	II	I	II^2	II	III	V^4	V^4	II^3	V^4	V^4
D.S. Ass. ***Asaro-Abietetum sibiricae***													
Atragene sibirica	-hl	V	.	.	I	.	.	I	.	.	.	.	.
Cinna latifolia	-hl	IV	.	.	II	.	.	.	.	.	.	.	.
Epilobium montanum	-hl	III	.	.	.	.	+	.	.	.	.	.	.
Anthriscus sylvestris	-hl	III	II	.	II	+	II	II	.	.	I	V^2	V^2
D.S. Ass. ***Violo uniflorae-Abietetum sibiricae***													
Viola uniflora	-hl	.	V^2	.	.	IV	I	.	.	IV	.	IV^2	V^2
Cirsium serratuloides	-hl	.	IV	.	.	.	.	V	.	.	I	.	.
Alfredia cernua	-hl	.	III	.	.	II	.	V^2	.	.	.	+	.
Dentaria sibirica	-hl	.	III	.	.	.	II	.	.	.	.	.	.
Polygonatum odoratum	-hl	.	III	.	.	.	.	.	.	.	.	.	.
Viola mirabilis	-hl	.	III	.	.	.	+	.	.	.	III	+	.
D.S. Ass. ***Violo biflorae-Abietetum sibiricae***													
Oreopteris limbosperma	-hl	.	.	V^2	.	.	.	.	.	.	.	.	.
Viola biflora	-hl	I	.	V^2	.	.	V^2	.	II	.	.	.	I
Ranunculus grandifolius	-hl	.	.	V	II	.	II	II	III	II	.	.	.
Adenophora liliifolia	-hl	.	.	IV	.	.	.	.	.	.	I	.	.
Caltha palustris	-hl	.	.	IV	.	.	III	.	II	.	.	.	III
D.S. Ass. ***Anemonoido baicalensis-Abietetum sibiricae***													
Arsenjevia baikalensis	-hl	.	.	.	V^2	.	.	.	.	V^2	.	.	.
Anemonoides reflexa	-hl	.	.	.	IV	.	.	.	.	V	.	.	.
Corydalis bulbosa	-hl	.	.	.	IV	.	.	.	.	III	.	.	.
Allium microdictyon	-hl	.	.	II	IV	II	III^2	.	.	II	.	.	IV
Anemonoides jenisseens	-hl	.	.	.	III	.	.	.	.	V	.	.	.
Vicia sepium	-hl	.	.	.	III	.	.	.	.	IV	I	III	I
D.S. Ass. ***Geranio robertiani-Tilietum sibiricae***													
Tilia sibirica	-t1	.	.	.	.	V^5	.	.	.	.	.	.	.
Aegopodium podagraria	-hl	.	.	.	.	V^2	.	.	.	.	V^3	V^3	.
Geranium robertianum	-hl	.	I	.	.	IV	I	.	.	.	.	.	.
Sambucus sibirica	-s1	.	.	I	III	III	I	V	II	.	IV^2	+	.
D.S. ***Cacalio hastatae-Abietetum sibiricae***													
Ranunculus monophyllus	-hl	.	.	I	.	.	IV	.	.	.	V	V	III^2
Osmorhiza aristata	-hl	IV	III^2	II	.	II	IV	.	.	.	.	.	.
Bupleurum aureum	-hl	II	III^2	.	.	+	III	IV	.	I	.	V^2	.
D.S. ***Dactylido-Abietetum sibiricae***													
Conioselinum tataricum	-hl	.	.	.	.	.	.	V	.	.	.	.	.
Dactylis glomerata	-hl	II	.	.	I	.	.	V	.	.	I	II	.
Leontice armeniaca	-hl	.	.	.	.	.	.	V	.	.	.	.	.
Angelica decurrens	-hl	.	.	.	.	.	.	IV^2	.	.	.	.	.
Hesperis sibirica	-hl	.	.	.	.	I	.	IV	.	.	.	.	.

Table VIII (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12
Geum aleppicum	-hl	.	.	.	.	.	.	III	.	.	.	I	.
Melilotoides platycarpos	-hl	.	.	.	II	.	.	III	.	.	.	.	.
D.S. ***Festuco giganteae-Populetum tremulae***													
Oxalis acetosella	-hl	V²	III²	V²	V²	V²	V²	.	IV	.	IV	.	.
Dryopteris expansa	-hl	V	.	IV²	V²	IV	IV	.	III	.	.	.	I
Caragana frutex	-s1	.	I	.	.	I	+	.	III	.	.	.	.
Equisetum hyemale	-hl	I	.	.	.	I	.	.	III	.	.	.	.
D.S. ***Anemonoido jenisseensis-Populetum tremulae***													
Vicia sylvatica	-hl	.	.	.	I	.	.	.	.	V	.	II	.
Salix caprea	-s1	.	.	.	II	.	+	II	I	III	II	+	.
D.S. Ass. ***Equiseto pratensis-Padetum***													
Equisetum pratense	-hl	I	.	I	II	.	+	.	.	II	V²	.	.
Elymus caninus	-hl	II	.	.	II	.	.	II	.	II	V	.	.
Lamium album	-hl	II	III	.	II	IV	IV	.	.	I	V²	V	IV
Glechoma hederacea	-hl	.	.	.	I	.	.	.	.	.	IV	.	.
Rosa majalis	-s1	.	.	.	.	.	.	II	.	.	III²	.	.
Arctium tomentosum		.	.	.	.	.	.	.	.	.	III	.	.
D.S. Ass. ***Geranio sylvatici-Populetum tremulae***													
Geranium sylvaticum	-hl	.	.	.	.	.	.	.	.	.	I	V	.
Lathyrus vernus	-hl	.	.	.	.	.	.	.	.	.	.	III	.
D.S. Ass. ***Saussureo latifoliae-Populetum tremulae***													
Saussurea latifolia	-hl	III	.	II	I	IV	IV	.	I	.	.	.	V²
Dryopteris carthusiana	-hl	.	III	IV²	III	III	V²	.	II	.	I	.	III
D.S. Suball. ***Cruciato krylovii-Abietenion sibiricae***													
Spiraea chamaedryfolia	-s1	V²	V²	IV²	IV	.	II	.	IV	II	.	.	I
Cruciata krylovii	-hl	V	V²	V²	IV	.	II	.	V	V²	.	.	.
Cerastium pauciflorum	-hl	III	.	IV	IV	.	.	.	II	.	.	.	.
D.S. All. ***Milio-Abietion sibiricae*** = D.S. Suball. ***Milio-Abietenion sibiricae***													
Circaea alpina	-hl	V	I	IV	IV²	II	+	.	.	.	I	.	.
Maianthemum bifolium	-hl	IV	II	V²	V	III	V	.	I	III	V	.	.
Phegopteris connectilis	-hl	IV	.	V²	IV	I	V²	.	I	.	I	.	.
Diplazium sibiricum	-hl	IV	I	IV²	II	IV	II	.	I	.	.	.	.
Rhytidiadelphus triquetrus	-ml	IV²	III	III²	V²	III	.	.	I	I	.	.	.
Gymnocarpium dryopteris	-hl	III	.	II	III	.	II	.	.	.	.	.	I
D.S. All. ***Filipendulo ulmariae-Populion tremulae***													
Filipendula ulmaria	-hl	I	.	.	II	I	I	II	IV	IV	II	III²	III
Impatiens noli-tangere	-hl	.	.	.	II	IV	.	IV	I	III	II	II	III
Polemonium coeruleum	-hl	.	I	II	I	I	II	V	V²	III	.	IV	V²
Delphinium elatum	-hl	I	.	.	.	I	.	V	.	IV	.	III	V
Humulus lupulus	-hl	II	III	.	III	I	.	IV	I	III	IV²	III	III
D.S. Subord. ***Abietenalia sibiricae***													
Sorbus sibirica	-s1	V	V²	V	V	III	V²	V	IV	II	II	I	III
Aconitum septentrionale	-hl	V²	V²	V²	V²	V²	V²	V²	V²	V²	IV²	V³	V⁴
Lathyrus gmelinii	-hl	V²	I	IV	IV	IV	V	V²	II	V	.	V²	V
Stellaria bungeana	-hl	V²	V²	IV	V	V	V	.	V	V²	V²	V²	V²
Cacalia hastata	-hl	IV	III	II	IV	V	V	V	III	V	V	IV	V²
Carex macroura	-hl	IV	V²	IV	IV	II	.	III	V²	I	IV	.	.
Calamagrostis obtusata	-hl	III	V²	V²	V²	+	V²	.	V²	IV	I	I	II
Cirsium heterophyllum	-hl	II	II	V	IV	IV	IV	V²	IV	V	I	IV²	IV
Crepis sibirica	-hl	V	III	V	IV	V²	V²	V²	IV	V	II	V	V
Pulmonaria mollis	-hl	.	III	III	V	V²	III	V	III	IV	IV	III	V
Heracleum dissectum	-hl	V	III	II	II	II	+	V	III	IV	.	IV²	V
Paeonia anomala	-hl	I	V	III	III	III	IV	IV	IV	V	V²	IV	II
Corydalis bracteata	-hl	.	III	III	V	IV²	III	IV	I	V	I	.	III
Erythronium sibiricum	-hl	.	V²	IV²	III	V²	V²	V²	IV²	III	.	+	V
Geranium albiflorum	-hl	.	II	V²	V	III	V	II	IV²	V	.	.	.

Table VIII (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Pleurospermum uralense	-hl	.	III	I	IV	III	IV	I	I	III	.	III	III
Euphorbia pilosa	-hl	.	II	V	II	III	V	.	V	IV	.	V	V
D.S. Cl. ***Querco-Fagetea***, ord. ***Fagetalia sylvaticae***													
Milium effusum	-hl	V	II	IV^2	V^2	V	IV^2	V^2	IV^2	V	II	V	V
Dryopteris filix-mas	-hl	III	III	V^2	V	V^2	IV	IV	IV	.	.	.	II
Anemonoides altaica	-hl	.	III^2	IV	V	V	V^2	III	V	V^2	.	V^2	V
Stachys sylvatica	-hl	.	III	II	IV	IV	III	V	II	III	.	IV	V
Viburnum opulus	-s1	.	IV^2	.	V	II	III	V	I	IV	II	.	.
Brachypodium sylvaticum	-hl	.	III^2	V^2	I	II	III^2	V^2	II^2	.	.	.	.
Paris quadrifolia	-hl	II	III	IV	V	II	V	.	II	III	V	IV	V
Adoxa moschatellina	-hl	II	II	III	IV	III	IV	III	III	III	III	V	V
Sanicula europaea	-hl	V	III^2	III^2	.	IV^2	III	.	.	.	.	.	.
Festuca altissima	-hl	V	I	V	.	IV	III	II	I	.	.	.	.
Asarum europaeum	-hl	V	V^2	I	.	V^2	IV	.	.	.	.	.	.
Melica nutans	-hl	II	V	III	.	.	III	II	III	.	II	.	.
Daphne mezereum	-hl	I	I	II	IV	+	I	.	I	.	.	.	I
Galium odoratum	-hl	II	II	V^2	IV^2	V^2	V^2	.	.	.	.	.	.
Carex sylvatica	-hl	.	.	IV	.	I	.	IV	I	.	.	.	.
Festuca gigantea	-hl	.	.	.	III	III	+	V	IV	II	.	.	.
Polystichum braunii	-hl	II	I	.	IV	V	.	.	.	.	.	.	.
Bromopsis benekenii	-hl	.	.	.	.	III	.	V	.	.	.	.	.
Actaea spicata	-hl	.	.	.	II	III	.	I	.	.	.	.	I
Scrophularia nodosa	-hl	.	.	.	III	.	.	.	I	II	.	.	.
Lonicera xylosteum	-s1	.	.	.	II	.	.	.	.	.	III	.	III
Chrysosplenium alternifolium	-hl	.	.	.	II	.	.	.	.	.	.	.	.
Other species:													
Padus avium	-s1	IV	V^2	IV^2	V^2	III^2	V^2	V	V^2	IV	V^4	IV	V
Athyrium filix-femina	-hl	V^2	IV^2	V^2	V^2	V^2	V^2	V	V^2	V	IV^2	+	V^2
Angelica sylvestris	-hl	V	V	II	V	III	V	V^2	V	IV	I	I	.
Thalictrum minus	-hl	V	V	IV	V	II	IV	.	V	III	IV	IV	V
Ribes atropurpureum	-s1	V	III^2	III^2	III	II	IV	IV	IV	.	.	I	V
Caragana arborescens	-s1	V	V^3	.	II	III	+	IV	.	.	V^2	.	V
Equisetum sylvaticum	-hl	.	.	IV	II	III	III	II	V	IV	II	II	II
Matteuccia struthiopteris	-hl	II	.	II	V^2	V^2	III^2	.	III^2	V^3	V^3	III^2	V^3
Calamagrostis langsdorffii	-hl	I	I	V^2	IV	II	III^2	.	V	V	I	.	III
Senecio nemorensis	-hl	.	II	V^2	V	I	IV	III	V	V	.	I	V
Rubus idaeus	-s1	III	II	II	IV	+	I	III	I	.	IV^2	I	.
Urtica dioica	-hl	III	II	.	IV	V^2	II	V^2	II	III	V^2	V^2	V
Anemonoides caerulea	-hl	.	V^2	IV^2	.	V^2	V	IV	V^2	.	.	.	.
Pteridium aquilinum	-hl	I	IV^2	IV	III	+	V^2	IV^2	V	V^2	.	IV	I
Rhodobryum roseum	-ml	.	III	V^2	IV	IV	V	IV	.	III	.	.	.
Plagiomnium cuspidatum	-ml	.	III	V^2	III	III	V	III	III	IV	.	.	.
Ribes hispidulum	-s1	.	III	II	IV	IV	II	II	II	I	V^2	.	.
Lilium pilosiusculum	-hl	I	III	.	V	I	III	II	.	III	I	V	.
Solidago virgaurea incl. *S. dahurica*	-hl	V	IV	V	II	+	II	V	I	.	.	.	I
Myosotis krylovii	-hl	.	.	V	.	V	V^2	V^2	II	.	.	+	III
Mnium stellare	-ml	.	.	V	III	.	IV	II	II	III	.	.	.
Pleurozium schreberi	-ml	.	II	IV^2	V^2	II	II	.	III	III	.	.	.
Crepis lyrata	-hl	II	.	IV^2	II	III	I	IV	III	.	.	.	.
Galium boreale	-hl	II	III	II	IV	.	II	IV	I	.	.	.	I
Aconitum volubile	-hl	I	II	III	III	III	IV	.	IV	.	I	+	I
Rhytidiadelphus sp.	-ml	.	II	V^2	.	III	IV	II	II	.	.	.	.
Veratrum lobelianum	-hl	II	I	II	II	I	IV	V	.	IV	I	III	V
Brunnera sibirica	-hl	.	.	IV^2	V^2	.	.	.	IV^2	V^2	.	.	.
Brachythecium salebrosum	-ml	.	.	IV	.	III	II	III	II	.	.	.	.
Dicranum majus	-ml	.	.	IV	.	III	III	I	II	.	.	.	.
Plagiomnium drummondii	-ml	.	.	III	IV	II	III	I	II	II	.	.	.
Plagiomnium ellipticum	-ml	.	I	IV	.	.	III	.	I	.	.	.	.
Plagiochila porelloides	-ml	.	.	III	.	.	III	.	.	.	.	.	.
Polytrichum strictum	-ml	.	.	III	.	.	.	.	.	.	.	.	.
Dicranum congestum	-ml	.	.	III	III	II	II	.	I	II	.	.	.
Hylocomium splendens	-ml	III	.	.	III	.	.	.	.	.	.	.	.
Sanionia uncinata	-ml	.	.	III	.	.	I	I	.	.	.	.	.

Table VIII (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12
Eurhynchium angustirete	-ml	.	.	III	IV	.	III	.	II	II	.	.	.
Trollius asiaticus	-hl	.	.	III	.	.	IV	IV	.	.	I	II	.
Brachythecium reflexum	-ml	.	.	III	II	.	III	I	I	I	.	.	.
Plagiothecium denticulatum	-ml	.	.	III	.	.	II	.	.	II	.	.	.
Brachythecium starkei	-ml	.	.	III	III	.	II	.	I	I	.	.	.
Cirriphyllum piliferum	-ml	.	.	II	IV	.	II	.	.	I	.	.	.
Eurhynchium pulchellum	-ml	.	.	II	III	.	II	.	I	I	.	.	.
Eurhynchium sp.	-ml	.	.	.	.	III	.	.	.	.	I	.	.
Ptilidium pulcherrimum	-ml	.	.	.	II	.	.	.	.	III	.	.	.
Actaea erythrocarpa	-hl	II	.	.	I	.	.	.	I	.	.	.	.
Chelidonium majus	-hl	II	.	.	.	.	.	.	.	.	.	.	.
Cimicifuga foetida	-hl	II	.	.	I	.	.	.	.	.	.	.	.
Cortusa altaica	-hl	.	.	II	.	.	.	.	.	.	.	.	.
Dicranum polysetum	-ml	.	.	II	.	I	I	I	I	.	.	.	.
Dicranum sp.	-ml	.	.	II	.	.	.	.	.	.	.	.	.
Hylocomiastrum pyrenaicum	-ml	.	.	II	.	.	.	.	.	.	.	.	.
Linnaea borealis	-hl	.	.	II	.	.	.	.	.	.	.	.	.
Lycopodium annotinum	-hl	II	.	II	I	.	.	.	.	.	.	.	.
Polytrichum formosum	-ml	.	.	II	.	.	I	.	.	.	.	.	.
Ptilium crista-castrensis	-ml	I	.	II	II	.	.	.	.	.	.	.	.
Vaccinium myrtillus	-hl	.	.	II	.	.	.	.	.	.	.	.	.
Saxifraga punctata	-hl	.	.	II	.	.	I	.	II	.	.	.	.
Dactylorhiza fuchsii	-hl	.	.	.	II	.	.	.	I	.	.	.	.
Homalia trichomanoides	-ml	.	.	I	II	.	.	.	.	.	.	.	.
Lactuca sibirica	-hl	.	.	.	II	.	.	.	.	.	.	.	.
Myosotis palustris	-hl	.	.	.	II	.	.	.	.	.	.	.	.
Polytrichum commune	-ml	.	.	.	II	.	.	.	.	.	.	.	.
Ribes nigrum	-s1	.	.	I	II	.	I	.	I	I	II	.	.
Rosa acicularis	-s1	.	.	.	II	.	.	.	.	.	I	.	.
Trientalis europaea	-hl	.	.	I	II	.	I	.	.	.	.	.	.
Viola selkirkii	-hl	.	.	.	II	.	.	.	.	.	I	.	I
Amblystegium serpens	-ml	.	.	I	.	.	II	.	.	.	.	.	.
Barbilophozia lycopodiodes	-ml	.	.	.	.	.	II	.	II	.	.	.	.
Dicranum fuscescens	-ml	.	.	I	.	I	II	I	I	.	.	.	.
Carduus crispus	-hl	.	.	.	.	+	.	II	.	.	.	.	.
Cirsium incanum	-hl	.	.	.	.	.	.	II	.	.	.	.	.
Melandrium album	-hl	.	.	.	.	.	.	II	.	.	.	.	.
Plagiothecium berggreni	-ml	.	.	.	.	.	.	II	.	.	.	.	.
Vicia lilacina	-hl	.	.	.	.	.	.	II	.	II	.	.	.
Spiraea media	-s1	.	I	.	I	.	.	I	II	.	.	II	.
Agrimonia pilosa	-hl	.	.	.	.	.	.	I	.	.	II	.	.
Arabis pendula	-hl	I	.	.	.	.	.	.	.	.	II	.	.
Athyrium distentifolium	-hl	.	.	.	.	.	.	.	.	.	II	.	.
Cystopteris fragilis	-hl	.	.	.	.	.	.	.	.	.	II	.	.
Cuscuta europaea	-hl	.	.	.	.	.	.	.	.	.	II	.	.
Geum rivale	-hl	.	.	.	.	.	.	.	.	.	II	II	.
Picea obovata	-t1	.	.	.	I	.	.	.	.	.	II	.	.
Rubus saxatilis	-hl	.	.	.	.	.	.	.	.	.	II	.	.
Chamaenerion angustifolium	-hl	.	.	.	.	.	I	.	I	.	.	II	.

Species with few occurrences:

Alopecurus pratensis (hl) - 11(I), *Anemonoides* sp. (hl) – 10(I), *Atrichum flavisetum* (ml) - 6(+), *Betula pubescens* (t1) – 10(I), *Cardamine pratensis* (hl) - 8(I), *Cerastium davuricum* (hl) – 11(I), *Circaea caulescens* (hl) - 4(I), *Crataegus sanguinea* (s1) – 10(I), *Dicranum scoparium* (ml) – 3(I), 5(I), 6(+), *Festuca extremiorientalis* (hl) - 4(I), *Galium mollugo* (hl) – 12(I), *Hypericum hirsutum* (hl) – 2(I), 5(+), 7(I), *Lycopodium clavatum* (hl) - 4(I), *Malus* sp. (s1) - 4(I), *Thuidium philibertii* (ml) - 3(I), *Fragaria vesca* (hl) - 1(I), *Lonicera altaica* (s1) – 8(I), *Luzula pilosa* (hl) - 4(I), 6(+), *Lysimachia vulgaris* (hl) - 4(I), 6(+), 10(I), *Mnium* sp. (ml) - 6(I), *Moneses uniflora* (hl) - 4(I), *Phlomoides tuberosa* (hl) – (I), *Plagiomnium medium* (ml) - 3(I), *Poa pratensis* (hl) – 11(I), *Primula pallasii* (hl) – 2(I), 6(I), *Pyrola incarnata* (hl) - 8(I), *Ranunculus repens* (hl) - 8(I), 10(I), *Rhizomnium punctatum* (ml) - 3(I), 6(I), *Rubus arcticus* (hl) – 10(I), *Salix bebbiana* (s1) – 11(I), *S. dasyclados* (t1) – 10(I), *S. pseudopentandra* (t1) – 10(I), *Senecio* sp. (hl) – 10(I), *Veronica longifolia* (hl) - 4(I), *Viola hirta* (hl) - 2(I).

Table IX — Class *Pulsatillo-Pinetea*

Relevé nr.		1 2 3 4 5 6 7 8 9	1 0	1 1 2	1 1 3	1 1 4	1 1 5	1 1 6	1 1 7	1 1 8	1 2 9	2 2 0	2 2 1	2 2 2	2 2 3	2 2 4	2 2 5	2 2 6	2 2 7	2 2 8	2 3 9	3 3 0	3 3 1	3 2
D.S. Ass. ***Carici supinae-Pinetum sylvestris***																							
Carex supina	-hl	2 2 2 2 2 2 2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 1 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	. . .	. . .	. . .	. . .	. . .	. .
Linaria vulgaris	-hl	. + + + 1 + + + +	1 . .	+ 1 +	1 + 1	1 + +	+ . +	+ + .	+ 1 +	+ + +	. + +	+ . +	. + .	+ + +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Carex praecox	-hl	1 . . + ... +	1 1	+ + +	+ + +	+ 1 1	. . +	+ . .	. . .	. . .	. . .	+ . .	+ . .	+ + .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Dianthus superbus	-hl	. . + + + + + + +	. + .	+ + .	+ + .	+ + .	+ . .	+ + +	+ . +	. . .	. . .	. . .	. . .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Silene repens	-hl	. + + + + 1 . + .	+ + .	. . +	. . +	. + .	. + +	+ . .	+ + +	. . .	+ . .	. . +	1 1 +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Kitagawia baicalensis	-hl	. . . . . + . . +	. + +	+ + +	+ + +	+ + +	+ + +	. . .	. . .	. . .	+ + .	. . +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Arabidopsis bactriana	-hl	. . . 1 + . + + .	+ + +	1 . 1	+ + +	. . .	. . .	. . .	. . .	. . .	+ . .	. . +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Euphorbia subcordata	-hl	. . . + ...	+ + +	. + +	+ + +	. . .	+ . .	. . .	. . .	. . .	+ . .	+ . .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
D.S. Subass. ***C. s.-P.s. typicum* var. *Veronica verna***																							
Filago arvensis	-hl	. . . . . + + . .	+ . +	. + .	+ . .	+ . .	+ + .	. + .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Veronica verna	-hl	. . . . + . + . +	. . .	+ + .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Draba nemorosa	-hl	. . . . + . + . +	. + +	. . +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Scorzonera ensifolia	-hl	. . . . . + . + .	. . +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Erysimum hieracifolium	-hl	. . . . . + . . .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Linaria genistifolia	-hl	. . . . . . + . +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Medicago falcata	-hl	. . . . . + + . .	. + .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
D.S. Subass. ***C. s.-P. caraganetosum arborescentis***																							
Caragana arborescens	-s1	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	2 1 1	2 1 1	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	. . .	. . .	. . .	. . .	. . .	. .
Oxytropis campanulata	-hl	. . . .	. + .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	+ . 1	+ 1 1	+ 1 1	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Peucedanum morisonii	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ + .	+ + .	+ . +	. . +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Poa urssulensis	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	1 1 .	. . .	. . .	. . .	+ 1 .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
D.S. Ass. ***Artemisio scopariae-Pinetum sylvestris***																							
Viola arenaria	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	1 1 1	1 1 1	1 1 1	1 1 1	1 1
Potentilla humifusa	-hl	. . . + ...	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	+ . .	. + .	. . .	. . .	. . .	. . .	. . .	+ + .	+ + .	+ + .	+ + .	+ +
Rumex acetosella	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	. . .	. . .	. . .	. + .	. . .	. . .	. . .	. . .	+ + .	+ + .	+ + .	+ + .	+ 1
Erigeron uralensis	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ + .	+ + .	+ + .	+ + .	+ +
Polygonatum odoratum	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	1 . .	1 . .	+ . .	+
Psammophiliella muralis	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. 1 +	+ + .	+ + .	+ + .	+
Dianthus acicularis	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ + .	. . .	. . .	. . .	+
Senecio jacobaea	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	1 + .	+ . .	+ . .	+ . .	+
Potentilla argentea	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. + .	. . .	. . .	. . .	+
Stellaria graminea	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. + +	. . .	. . .	. . .	.
Antennaria dioica	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . 1	1 1 .	. . .	. . .	.
Eremogone longifolia	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	. . .	. . .	+
Hieracium echioides	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	+ . .	. . .	.
D.S. Ord. ***Koelerio glaucae-Pinetalia*** and Cl. ***Pulsatillo-Pinetea***																							
Pinus sylvestris	-t1	4 4 4 4 4 4 4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	3 3 4	3 3 4	3 3 4	3 3 4	3 3 4	3 3 4	3 3 4	3 3 4	3 3 4	3 3
Veronica spicata	-hl	+ + + 1 1 + 1 1 +	+ + +	+ 1 1	+ 1 1	+ 1 1	+ 1 1	+ + +	+ + +	1 1 1	1 1 1	1 1 1	1 1 1	+ 2 1	+ 2 1	+ 2 1	+ 2 1	+ 2 1	+ 2 1	+ 2 1	+ 2 1	+ 2 1	+ 1
Koeleria glaucа	-hl	. 1 + 1 + + 1 1 1	1 1 1	+ 1 1	1 1 1	1 1 1	1 . +	+ + +	+ + +	+ . .	+ . +	+ + 1	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2
Carex ericetorum	-hl	. 1 . + 1 1 1 1 .	. + 1	+ 1 +	. . .	1 + 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2
Pulsatilla patens	-hl	. . + 1 1 1 1 1 1	1 1 1	1 1 1	1 1 1	+ . .	+ + +	. + .	1 . .	1 . .	1 . .	1 . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . +
Silene chlorantha	-hl	. + + ... + +	. . +	. . +	. . +	. . +	. . +	. . .	. . .	. . .	. . .	+ + .	. + .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Festuca beckeri	-hl	. + + . . + . + +	+ . +	1 + 1	+ + +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	. . .	. . .	. . .	2 2 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1
Artemisia scoparia	-hl	. . . + + + . + +	r . .	+ + +	1 . .	. + +	+ . +	+ + .	+ . .	+ . .	+ + .	+ . .	+ + .	+ 1 1	+ . .	. . .	. . .	. . .	1 1 1	1 1 1	1 1 1	1 1 1	1 1
Phleum phleoides	-hl	. . . + . . . + + +	+ . .	+ + .	+ + .	+ . .	+ + .	+ . .	+ . .	+ . .	+ + .	+ + +	+ + +	+ 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1
Silene baschkirorum	-hl	. + + + . + + . +	+ + +	. + +	. + +	. + +	. + .	. . .	. . .	. . .	. . .	+ + .	+ . +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Gypsophila altissima	-hl	. . . 1 + 1 . . +	+ 1 1	+ 1 1	. + +	. . .	. . .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	+ .	+
Gypsophila paniculata	-hl	. + + + . . 1 . .	+ . .	. + .	1 + +	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	+ . +	1 + 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1
Stipa sabuletorum	-hl	. . + + ... +	. r .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . .	+ . .	. . +	+ + +	. . .	. . +	. . .	. . .	. . .	. . .	. . .	. . .	+ +
Jurinea cyanoides	-hl	. . . + . + + + .	. . .	. . .	. . .	. . .	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	+ . .	+ . .	+ . .	+ . .	+ . .	+ . .	+ . .	+
Hieracium pilosella	-hl	. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+ . .	. . +	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	.
Other species:																							
Calamagrostis epigeios	-hl	1 1 1 1 1 1 1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 2	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	+
Poa angustifolia	-hl	1 . 1 1 1 1 1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	+ . .	1 . .	1 . .	1 . .	+
Solidago virgaurea	-hl	. . + + + + . + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	1 1 +	+ + +	+ 1 1	+ + +	+ + +	+ . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
Hieracium umbellatum	-hl	. + + + + + + + +	+ + +	. + +	+ + +	. . .	+ + +	. . .	. . .	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	. . .	. . 1	+ . .	. . .	.
Silene nutans	-hl	. . + . + + . . +	. . +	+ + +	. + .	+ + .	+ . .	+ + +	. + .	+ . .	+ . .	+ . .	1 . .	+ + +	. r .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	+

Table IX (continuation)

Relevé nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Dianthus versicolor	-hl	.	.	+	.	.	+	.	.	+	.	.	.	.	+	.	+	.	.	+	.	+	.	.	.	+	+	.	.	.	.	.	+
Lupinaster pentaphyllus	-hl	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	.	+	+	+	+	+	+	.	r	+	.	.
Equisetum hyemale	-hl	.	.	+	.	+	.	.	.	.	.	.	+	+	+	.	+	.	.	.	.	+	.	+	+	.	+	+	.	r	.	.	.
Galium verum	-hl	.	.	+	.	.	+	.	+	.	.	+	+	+	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Polytrichum juniperinum	-ml	+	.	.	.	+	1	.	+	.	+	.	+	+	.	.	.	+	.	.	+	.	.	1	.	.	.	.	1	1	+	1	+
Cladina arbuscula	-ml	.	+	.	+	.	.	r	+	+	.	.	.	+	.	.	.	+	.	.	+	.	.	+	+	.	.	+	+	.	.	.	+
Cladina mitis	-ml	.	.	.	.	+	.	.	.	+	.	.	r	+	.	.	.	.	+	.	.	.	+	.	.	+	.	.	.	.	+	.	.
Cladina rangiferina	-ml	.	+	.	.	.	.	.	+	+	.	.	.	+	.	.	.	+	.	.	.	.	.	+	.	.	r	.	+	.	.	.	+
Cladonia gracilis	-ml	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	r	.	+	.	.	r	.	.	.	.	.	.	.	.	+	.	.
Cladina portentosa	-ml	.	.	.	+	.	.	.	r	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	r	.	.	.
Dracocephalum nutans	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	+	.	+	.	+	.	.	.	.	.	.	.
Achillea millefolium	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	1	.	.	.	.	.	+	.	.
Crepis sp.	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+

Species with few occurrences: *Allium nutans* hl - 17(+), 27(+), *Alyssum turkestanicum* hl - 13(+), 16(+), *Artemisia commutata* hl - 16(+), *dracunculus* hl - 17(+), *A. glauca* hl - 5(1), *Asparagus officinalis* hl - 4(r), *Berteroa incana* hl - 31(+), *Betula pendula* t1 - 28(+), *Brachythecium salebrosum* ml - 31(r), *Carlina biebersteinii* hl - 20(+), 27(+), *Chondrilla pauciflora* hl - 13(+), *Cladina stellaris* hl - 4(+), *Cladonia cariosa* hl - 22(r), *C. coccifera* hl - 22(+), 27(+), *C. fimbriata* hl - 24(+), *C. pleurota* hl - 4(+), 15(+), 19(+), 24(+), *C. uncialis* hl - 30(+), *Elytrigia repens* s1 - 3(+), *Galatella biflora* hl - 19(+), 23(+), 28(+), *Hylotelephium triphyllum* hl - 11(+), *Iris ruthenica* hl - 26(+), *Melandrium album* hl - 32(r), *Peltigera malacea* ml - 2(+), 16(+), 17(+), 23(+), 31(+), *Scabiosa ochroleuca* hl - 7(+), 16(r), 20(r), 29(+), *Silene multiflora* hl - 14(+), 18(+), 25(+), *Spiraea hypericifolia* s1 - 2(+), 7(+), 11(r), 18(+), *Taraxacum officinale* hl - 10(+), 19(+), *Trommsdorfia maculata* hl - 23(+), 30(r), *Turritis glabra* hl - 4(+), 27(r), *Vicia cracca* hl - 28 (+).

(Headings of relevés of Table IX).

Relevé nr.	Date	Area (m^2)	Altitude m	Aspect (°)	Slope (°)	Cover t1 (%)	Cover s1 (%)	Cover hl (%)	Cover ml (%)	Geographical coordinates Latitude	Longitude
1	11.06.1993	200	200	180	2	60	0	20	0	53°30'	81°19'
2	13.06.1993	200	200	157	1	60	15	15	0	51°51'	80°26'
3	13.06.1993	200	200	0	0	60	0	20	2	51°51'	80°26'
4	13.06.1993	200	200	202	1	50	0	12	3	51°51'	80°26'
5	13.06.1993	200	200	180	-	50	0	15		51°51'	80°26'
6	13.06.1993	200	200	225	-	60	0	20	0	51°51'	80°26'
7	13.06.1993	200	200	270	1	50	0	15	2	51°51'	80°26'
8	13.06.1993	200	200	0	0	50	0	15	2	51°51'	80°26'
9	13.06.1993	200	200	135	1	60	0	15	0	51°51'	80°26'
10	13.06.1993	200	220	180	1	50	0	15	3	51°48'	80°45'
11	13.06.1993	200	220	180	1	60	0	20	0	51°48'	80°45'
12	14.06.1993	200	220	180	1	50	0	20	2	51°48'	80°45'
13	13.06.1993	200	200	180	1	50	0	20	3	51°51'	80°26'
14	13.06.1993	200	200	180	1	50	0	20	0	51°51'	80°26'
15	13.06.1993	200	220	135	1	50	0	25	3	51°48'	80°45'
16	13.06.1993	200	220	180	1	50	0	15	3	51°48'	80°45'
17	11.06.1993	200	200	0	0	50	3	20		52°30'	81°19'
18	11.06.1993	200	200	0	0	60	3	15	0	52°30'	81°19'
19	12.06.1993	200	200	180	2	50	3	10	0	52°07'	81°06'
20	12.06.1993	200	200	0	0	50	3	15	0	52°07'	81°06'
21	12.06.1993	200	200	180	1	60	3	15		52°07'	81°06'
22	12.06.1993	200	200	180	2	50	15	15		52°07'	81°06'
23	12.06.1993	200	200	180	1	60	5	15		52°07'	81°06'
24	12.06.1993	200	200	180	1	60	5	10		52°07'	81°06'
25	12.06.1993	200	200	180	1	40	15	50	3	52°07'	81°06'
26	12.06.1993	200	200	180	1	40	5	35	0	52°07'	81°06'
27	12.06.1993	200	200	180	1	60	15	20	0	52°07'	81°06'
28	05.07.1997	200		45	1	25	3	18	0	55°22'	65°17'
29	05.07.1997	200		40	2	30	5	17	0	55°22'	65°17'
30	05.07.1997	200		55	2	20		18	0	55°22'	65°17'
31	05.07.1997	200		40	1	20	3	18	0	55°22'	65°17'
32	05.07.1997	200		45	2	30		18	0	55°22'	65°17'

Table X — Class *Querco mongolicae-Betuletea davuricae*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Mean altitude (m)		907	844	853	320	690	920	950	905	1010	880	850	315	850	900	860	950	870
Mean cover of tree layer %		46	60	58	45	48	59	59	53	62	63	64	42	62	63	61	62	66
Mean cover of shrub layer (%)		12	3	4	8	4	11	7	6	11	3	8	9	1	2	2	7	7
Mean cover of herb layer (%)		71	73	74	49	60	60	69	58	66	75	70	54	76	70	70	72	72
Mean cover of moss layer (%)		1	1	+	0	2	1	1	2	3	1	1	0	0	3	1	2	0
Mean heigt of tree layer (m)		11	16	16	18	21	20	21	20	21	17	17	20	24	18	19	21	22
Mean heigh of shrub layer (cm)		46	44	48	42	66	52	53	52	50	50	54	51	60	60	60	64	62
Mean height of herb layer (cm)		36	42	40	41	34	38	43	41	32	48	51	46	54	52	48	43	40
Mean nr. of species in one relevé		61	63	62	37	47	55	52	51	55	64	61	47	61	60	61	52	60
Relevé area (m^2)		Everywhere 200 m^2																
Number of species		105	131	135	101	77	114	158	120	128	112	113	106	88	102	112	133	124
Number of relevés		7	16	16	15	6	13	31	10	10	12	15	8	8	9	7	12	8
Species of tree layer																		
Betula platyphylla	-t1	.	V^2	IV	III^2	V^2	V^4	V^3	IV	V^3	V^2	V^4	V^2	V^4	V^4	V^4	V^4	V^4
Betula davurica	-t1	V^4	V^4	V^4	V^2	.	.	.	.	.	V^4	.	III^2	.	.	.	.	.
Larix gmelinii inc. x *L. czekanowskii*	-t1	.	II	.	III	II	II	V^2	II^2	.	.	V^3	IV	V^2	.	III	IV	V
Populus tremula	-t1	.	II	III	III^2	.	III^2	III^2	III	IV	IV	IV^2	V^2	III	V^2	V^2	IV^2	II^3
Pinus sylvestris	-t1	.	.	.	II^2	V^2	I	V^3	V^4	V^3	.	.	.	II	I	IV^2	III^2	.
Quercus mongolica	-t1	.	.	.	II^2	.	.	.	.	.	.	.	V^2	.	.	.	.	.
D.S. Ass. ***Artemisio desertorum-Betuletum davuricae***																		
Artemisia desertorum	-hl	V^2	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex obtusata	-hl	V	+	.	.	.	.	I	+	.	.	.	.	.	.	.	+	.
Thalictrum petaloideum	-hl	V	II	II	.	I	II	.	.	.	.	.	.	.	.	.	.	.
Spiraea pubescens	-s1	V^2	I	.	.	V^2	III	.	.	.	+	.	.	.	.	.	.	.
Stemmacantha uniflora	-hl	V	III	+	.	V	II	I	III	+	.	.	.	.	.	I	.	.
Viola dissecta	-hl	V	+	I	.	.	.	+	I	.	.	.	.	.	.	.	.	.
Cotoneaster melanocarpus	-s1	V^2	I	+	.	.	+	II	II	II	.	.	.	.	II	II	I	.
Eremogone juncea	-hl	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla tanacetifolia	-hl	IV^2	I	I	.	.	.	I	.	.	.	.	.	.	.	.	.	.
Poa transbaicalica	-hl	IV	II	I	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Silene jeniseensis	-hl	IV	.	.	.	II	II	.	.	.	.	.	.	.	.	.	.	.
Euphorbia fischeriana	-hl	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Youngia tenuifolia	-hl	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Saposhnikovia divaricata	-hl	IV	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.
Phlojodicarpus sibiricus	-hl	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bupleurum sibiricum	-hl	III	+	.	.	IV	III	.	II	.	.	.	.	.	.	.	.	.
Cerastium arvense	-hl	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dianthus versicolor	-hl	III	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Koeleria cristata	-hl	III	.	.	.	V	I	r	+	.	.	.	.	.	.	.	.	I
Lespedeza juncea	-hl	III	.	.	.	V	.	.	.	.	.	.	.	.	.	.	.	.
Thesium refractum	-hl	III	I	.	I	IV	.	r	I	.	.	.	II	.	.	.	.	.
Filifolium sibiricum	-hl	III	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.
Adenophora gmelinii	-hl	III	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex nanella	-hl	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Iris humilis	-hl	III	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.
Hylotelephium triphyllum	-hl	III	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Spiraea dahurica	-s1	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia amurensis	-hl	III	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.
D.S. Ass. ***Geranio davurici-Betuletum davuricae***																		
Pyrola rotundifolia	-hl	.	V	IV	.	IV	IV	III^2	II	V^2	V	V^2	II	V^2	V^2	V^2	V^2	V
Malaxis monophyllos	-hl	.	IV	V	.	IV	I	II	.	II	IV	III	.	II	IV	V	II	IV
Anemonastrum crinitum	-hl	.	V	V^2	.	.	III	I	.	III	III	V^2	.	IV	.	II	III	.
Valeriana alternifolia	-hl	I	V	V	.	.	IV	r	.	.	V	V	.	V	V	V	II	V
Geranium davuricum	-hl	II	V	V	.	.	.	.	.	.	V	III	.	.	.	.	.	.
Heteropappus biennis	-hl	.	III	III	.	.	.	+	+	I	+	.	.	.	.	.	.	.
Variant ***Calamagrostis langsdorffii***																		
Viola collina	-hl	.	+	III	.	.	.	.	.	.	IV	.	.	.	.	.	.	.
Dictamnus dasycarpus	-hl	I	I	III	I	.	.	.	.	.	III	.	I	.	.	.	.	.
Helictotrichon dahuricum	-hl	.	I	III	I	.	.	.	.	.	III	.	V	.	.	.	.	.

Table X (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.S. Ass. ***Carici vanheurcki-Betuletum davuricae***																		
Carex supermascula	-hl	.	.	.	V²	.	.	.	.	.	.	.	III²	.	.	.	.	.
Adenophora triphylla	-hl	.	.	.	IV	.	.	.	.	.	.	.	V	.	.	.	.	.
Carex vanheurckii	-hl	.	.	.	IV	.	.	.	.	.	.	.	IV²	.	.	.	.	.
Campanula punctata	-hl	.	.	.	IV	.	.	.	.	.	.	.	III	.	.	.	.	.
Geranium orientale	-hl	.	.	.	III	.	.	.	.	.	.	.	V	.	.	.	.	.
Geranium maximowiczii	-hl	.	.	.	III	.	.	.	.	.	.	.	III	.	.	.	.	.
Euphorbia discolor	-hl	.	.	.	III	.	.	II	IV	+	.	.	II	.	.	.	I	.
Dianthus chinensis	-hl	.	.	.	III	.	.	.	.	.	.	.	II	.	.	.	.	.
Poa ochotensis	-hl	.	.	.	III	.	.	.	.	.	.	.	II	.	.	.	.	.
Calystegia inflata	-hl	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia commutata	-hl	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.
Lilium pumilum	-hl	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Oxytropido myriophyllae-Pinetum sylvestris***																		
Oxytropis myriophylla	-hl	I	.	.	.	V	I	.	+	.	.	.	.	.	.	.	.	.
Scabiosa comosa	-hl	.	+	II	.	V	.	.	.	.	.	.	.	.	.	.	.	.
Leibnitzia anandria	-hl	.	.	+	.	V	+	.	+	.	.	.	.	.	.	.	.	.
Helictotrichon schellianum	-hl	I	.	.	.	V	.	.	.	.	.	.	.	.	.	.	.	.
Pulsatilla turczaninovii	-hl	.	.	.	.	III	I	.	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Galatello dahuricae-Betuletum platyphyllae***																		
Poa urssulensis	-hl	.	II	III	.	.	V	+	+	I	II	I	.	V	V	V	.	II
Galatella dahurica	-hl	.	.	.	.	I	V	I	I	.	.	.	.	II	IV	III	II	II
Salix pseudopentandra	-s1	.	I	.	.	.	IV²	.	.	.	+	I	.	IV	III	III	.	.
Veratrum nigrum	-hl	.	II	I	.	II	IV	.	.	.	III	.	.	II	.	II	.	.
Salix abscondita	-s1	.	II	II	.	.	III²	+	.	+	III	III	.	II	II	III	I	III
D.S. Ass. ***Bromopsido pumpellianae-Pinetum sylvestris***																		
Geranium pseudosibirim	-hl	.	.	.	.	.	.	V	V	V	.	.	.	.	.	I	V	II
Bromopsis pumpelliana	-hl	.	.	I	.	.	II	V	V²	V	+	+	.	.	V²	V²	IV	II
Aconitum barbatum	-hl	.	II	I	III	.	.	IV	IV	III	.	.	III	.	.	I	+	II
Viola arenaria	-hl	.	.	.	.	.	.	IV	II	V	.	.	.	.	.	.	+	.
Vaccinium vitis-idaea	-hl	.	.	.	.	.	.	III²	II	IV²	.	III	III²	.	II	I	III²	.
Calamagrostis korotkyi	-hl	.	.	.	.	.	.	I	III	III	.	.	.	.	.	.	+	.
D.S. Subass. ***B.p.-P.s. potentilletosum longifoliae***																		
Ixeridium chinense	-hl	.	.	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.
Potentilla longifolia	-hl	.	.	.	.	.	II	r	IV	.	.	.	.	.	.	.	.	.
Kitagawia baicalensis	-hl	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.
Polygala sibirica	-hl	.	.	.	II	II	.	+	III	.	.	.	.	.	.	.	.	.
D.S. Subass. ***B.p.-P.s. vaccinietosum vitis-ideae***																		
Pyrola chlorantha	-hl	.	.	.	.	.	I	+	II	V	.	.	.	.	.	I	.	.
Crepis praemorsa	-hl	.	.	.	.	.	.	II	.	III	.	.	.	.	.	.	+	.
Thesium repens	-hl	.	.	.	.	.	.	+	.	III	.	.	.	.	.	.	.	.
D.S. Ass. ***Veronicastro sibiricae-Betuletum davuricae***																		
Viola brachysepala	-hl	.	II	III	.	.	.	.	.	.	V	.	.	.	.	.	.	.
Melica turczaninowiana	-hl	III	II	II	I	.	.	+	.	.	III	.	.	.	.	.	.	.
Serratula manshurica	-hl	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.
Pteridium aquilinum	-hl	.	.	I	.	.	.	.	+	.	III²	.	II	.	I	.	.	.
D.S. Ass. ***Geranio vlassowiani-Laricetum gmelinii***																		
Saussurea purpurata	-hl	.	.	.	.	.	.	.	.	.	.	V²	.	.	.	.	.	.
Trientalis europaea	-hl	.	.	.	.	.	.	.	.	.	.	V	.	II	I	.	II	.
Viola sacchalinensis	-hl	.	.	.	.	.	+	+	.	+	+	IV	.	.	I	.	.	.
Veratrum lobelianum	-hl	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	I
Ribes nigrum	-s1	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	I
Iris sanguinea	-hl	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	IV
Gentiana triflora	-hl	.	.	+	.	.	.	.	.	.	.	III	.	.	.	.	.	.
D.S. Ass. ***Aquilegio parviflorae-Quercetum mongolicae***																		
Saussurea recurvata	-hl	.	.	.	II	.	.	.	.	.	.	.	V	.	.	.	.	.
Aquilegia parviflora	-hl	.	.	.	II	.	.	.	.	.	.	.	V	.	.	.	.	.

Table X (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Bupleurum longiradiatum	-hl	.	.	.	+	.	.	.	.	.	.	I	V	.	.	.	.	.
Calamagrostis sugawarae	-hl	.	.	.	I	.	.	.	.	.	.	.	V^2	.	.	.	.	.
Gymnadenia conopsea	-hl	.	+	I	+	I	II	II	I	II	.	.	IV	.	II	.	.	II
Aruncus dioicus	-hl	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.
D.S. Ass. ***Veronico longifoliae-Laricetum gmelinii***																		
Veronica longifolia	-hl	.	.	.	+	.	I	.	.	.	.	.	.	V	II	.	II	III
Ptarmica alpina	-hl	.	.	.	.	.	.	.	.	.	.	.	.	IV	I	.	.	II
Aconitum ambiguum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	IV	IV	I	.	.
Tephroseris kirilowii	-hl	V	IV	III	I	.	.	.	.	.	II	.	.	IV	.	.	.	.
Carex schmidtii	-hl	.	.	.	.	.	.	.	.	.	.	II	.	III	I	.	+	I
Anemonidium dichotomum	-hl	.	.	.	+	.	.	.	.	.	.	.	I	III^2	.	.	+	.
D.S. Ass. ***Calamagrostio langsdorffii-Betuletum platyphyllae***																		
Elymus mutabilis	-hl	III	II	I	.	II	II	II	I	II	II	.	.	.	V	III	.	.
D.S. Subass. ***C.l.-B.p. artemisietosum sericeae***																		
Elymus komarovii	-hl	.	.	I	.	.	I	r	+	+	.	.	.	.	I	III	.	.
Gentiana macrophylla	-hl	.	II	II	.	.	+	+	I	II	II	+	.	I	.	III	II	V
D.S. Ass. ***Vicio venosae-Betuletum platyphyllae***																		
Vicia cracca	-hl	.	.	.	.	.	.	+	.	II	.	.	.	.	.	.	V	I
Trollius asiaticus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	IV	.
Viola uniflora	-hl	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	IV	.
Calamagrostis obtusata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	I
Thalictrum minus	-hl	.	.	.	IV^2	.	.	.	.	.	.	.	II	.	.	.	IV	II
D.S. Ass. ***Penthaphylloido fruticosae-Betuletum platyphyllae***																		
Salix pyrolifolia	-s1	.	.	+	.	.	II	IV	II	II	I	I	.	II	I	II	III	V
Trisetum sibiricum	-hl	.	.	.	.	.	.	I	.	+	.	+	.	.	I	I	II	V
Pentaphylloides fruticosa	-s1	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	II	IV
D.S. Suball. ***Paeonio lactiflorae-Betulenion davuricae***																		
Hemerocallis minor	-hl	V	III	III	IV^2	I	+	II	III	II	III	.	V	.	.	I	.	.
Kitagawia terebinthacea	-hl	V	IV	II	IV	.	II	.	.	.	+	.	II	.	II	II	.	.
Carex reventa	-hl	V^2	V^2	V^2	.	.	.	.	.	.	V^2	III	.	.	.	.	.	.
Paeonia lactiflora	-hl	V	IV^2	V^2	.	.	.	.	.	.	V	.	.	.	.	.	.	.
Vicia popovii	-hl	V	III	II	V	III	.	.	.	.	.	.	I	.	.	.	.	.
Scorzonera albicaulis	-hl	V	IV	V	.	.	.	.	.	.	II	I	.	.	.	.	.	.
Bistorta alopecuroides	-hl	III	III	IV	.	.	.	.	.	.	II	+	.	.	.	.	.	.
Polygonatum humile	-hl	I	V^2	V^2	III	.	.	.	.	.	V	I	IV	.	.	.	.	.
D.S. Suball. ***Calamagrostio epigei-Pinenion sylvestris***																		
Carex pediformis	-hl	.	.	.	.	V^2	II	III	IV^2	III	.	.	.	I	.	V	III	II
Astragalus adsurgens	-hl	.	.	.	.	V	III	II	III	I	.	.	.	.	.	.	.	I
Calamagrostis epigeios	-hl	.	.	+	.	IV	III	IV	V	V	.	.	.	.	.	II	III	II
Rhododendron dauricum	-s1	I	II	.	I	V	+	III^2	IV	III^2	.	III	II	.	II	II	II	.
Rhytidium rugosum	-ml	I	III	+	.	V^2	IV	II	III	III	.	II	.	.	II	I	.	.
Elymus sibiricus	-hl	.	I	+	.	IV	II	III	II	III	II	.	.	.	II	III	II	III
D.S. Suball. ***Convallario keiskei-Betulenion davuricae***																		
Convallaria keiskei	-hl	.	IV^2	IV^2	IV^2	.	.	.	.	.	V^2	V^2	V^2	.	.	.	.	.
Sorbaria sorbifolia	-s1	.	II	.	.	.	.	.	.	.	II	IV^2	III	.	.	.	.	I
Cimicifuga dahurica	-hl	.	II	II	.	.	.	.	.	.	IV^2	IV^2	.	.	.	.	.	.
Angelica czernaevia	-hl	.	I	+	.	.	.	.	.	.	V	V	.	.	.	.	.	.
Cimicifuga simplex	-hl	.	II	I	.	.	.	.	.	.	IV	IV	.	.	.	.	.	.
D.S. Suball. ***Bistorto viviparae-Betulenion platyphyllae***																		
Poa sibirica	-hl	I	.	.	.	.	V	III	.	II	III	I	.	V	V	V	V	V
Bistorta vivipara	-hl	.	.	.	.	I	II	+	.	+	.	.	.	V	IV	V	III	II
Pleurospermum uralense	-hl	.	.	.	.	.	.	r	.	.	.	.	.	V	V^2	III	IV	IV
Crepis sibirica	-hl	.	.	.	.	.	.	r	.	.	.	.	.	IV^2	IV	I	V	II
Campanula glomerata	-hl	.	.	.	.	.	II	II	+	II	.	.	.	V	IV	IV	IV	IV

Table X (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.S. All. ***Kitagawio terebinthaceae-Betulion davuricae***																		
Dendranthema zawadskii	-hl	V²	IV	IV	.	V	V	V	V	IV	.	II	.	III	V	V	II	.
Scorzonera radiata	-hl	V	II	II	III	V	IV	V	V	V	II	.	III	II	IV	V	II	II
Pulsatilla patens	-hl	V²	V²	V²	.	V	V	V²	V²	V	III	I	.	I	IV	V	+	I
Poa botryoides	-hl	V	III	IV	.	V	II	II	V	I	+	.	.	I	II	V	.	I
Artemisia sericea	-hl	V²	IV	IV²	.	.	V	III	III²	IV	.	.	.	.	II	V	.	.
Achnatherum sibiricum	-hl	V	V	IV	.	V	IV	III	IV	III	II	.	.	.	.	II	.	I
Aster alpinus	-hl	V	III	+	.	V	III	IV	IV	IV	.	.	.	.	I	.	.	II
Galium verum	-hl	V	V	V	I	I	III	+	II	.	II	.	I	.	.	I	.	I
Allium splendens	-hl	IV	V	III	II	.	.	III	IV	III	.	.	I	.	.	.	.	II
Schizonepeta multifida	-hl	V	III	II	.	II	+	+	II	.	.	.	.	.	.	.	.	.
Artemisia gmelinii	-hl	V²	.	+	III	III	+	.	I	+	.	.	I	.	.	.	.	.
Patrinia rupestris	-hl	V	.	.	IV	IV	.	+	III	+	.	.	II	.	.	.	.	.
Polygonatum odoratum	-hl	III	II	I	IV	.	II	I	III	+	.	.	I	.	I	I	.	.
Bupleurum scorzonerifolium	-hl	III	II	II	.	V	.	II	IV	II	.	.	.	.	.	.	.	.
Viola gmeliniana	-hl	.	II	+	.	IV	+	III	II	IV	+	.	.	.	.	I	.	I
Stellera chamaejasme	-hl	III	II	I	.	V	II	II	.	I	.	.	.	.	.	.	.	.
D.S. All. ***Ligulario fischeri-Betulion davuricae***																		
Ligularia fischeri	-hl	.	+	.	.	.	.	.	.	.	V	V	II	V	V	IV	I	V
Polemonium chinense	-hl	.	.	.	.	.	+	.	.	.	IV	V	III	V	V	III	V	V
Moehringia lateriflora	-hl	.	+	II	+	.	+	II	.	I	IV	IV	II	IV	III	III	IV	V
Maianthemum bifolium	-hl	.	.	.	.	.	.	II	.	II	I	V	IV	IV²	V	IV	III	II
Equisetum pratense	-hl	.	.	+	.	II	IV²	I	.	+	IV	V	IV	V²	V	V	V	V²
Calamagrostis langsdorffii	-hl	.	.	III²	II	.	II	r	.	.	V²	V²	I²	V²	V²	V²	+	IV
Veronicastrum sibiricum	-hl	.	+	II	II	.	.	.	.	.	V	I	I	V²	III	II²	.	I²
Geranium vlassowianum	-hl	.	.	.	.	.	+	r	.	.	II	V²	.	V²	IV²	II²	V²	V²
Carex pallida	-hl	.	.	.	.	.	.	.	.	.	.	III²	IV²	V²	II	I	III	I
Filipendula palmata	-hl	.	.	.	.	.	.	.	.	.	.	III	I	IV²	I²	.	III²	II
Trollius ledebourii	-hl	.	.	.	.	.	+	.	.	.	III	V²	I	V²	V	I	.	IV
Hedysarum alpinum	-hl	.	.	.	.	.	.	.	.	.	+	IV	.	II	II	III	III	V
Ranunculus japonicus	-hl	.	.	+	.	.	+	.	.	I	+	III	.	V	III	III	V	V
Thalictrum contortum	-hl	.	.	+	.	.	I	.	.	.	II	V	V	II	III²	I	.	IV
Cacalia hastata	-hl	.	.	.	.	.	.	.	.	.	II	IV	II	V²	III	.	I	II
Pedicularis resupinata	-hl	.	I	+	.	.	+	+	.	+	III	V	.	IV	V	II	II	IV
Solidago dahurica	-hl	.	.	.	.	.	.	.	.	.	III	IV	.	I	III	I	II	.
Aegopodium alpestre	-hl	.	.	.	.	.	.	I	.	+	.	IV	.	V	.	I	V	IV
Vicia venosa inc. var. *baicalensis*	-hl	.	.	.	.	.	.	r	.	+	.	V²	II	III	.	.	IV	I
D.S. Cl. ***Querco mongolicae-Betuletea davuricae***																		
Iris uniflora	-hl	V²	V²	V²	IV	V²	V²	V²	III²	V²	V²	V	IV²	V	V²	V²	III	IV
Fragaria orientalis	-hl	V	V²	V²	V	III	V²	V²	V²	V²	V²	V²	IV	V²	V²	V²	V²	V²
Potentilla fragarioides	-hl	V	V	V	V	V	V	III	II	II	V	.	IV	IV	I	III	III	V
Saussurea elongata	-hl	V	V	V²	.	V	V	V	IV	IV	V	V	.	V	V	V²	IV	IV
Vicia unijuga	-hl	.	IV²	III²	.	V	V	V²	V	V	II	I	.	IV	V²	V²	II	III
Astragalus membranaceus	-hl	V	V	III	I	V	V	V	IV	V	+	I	I	II	III	V	II	IV
Vicia pseudorobus	-hl	V²	V²	V²	IV²	.	IV²	+	.	.	V²	.	V²	.	I	.	.	.
Carex lanceolata	-hl	.	IV	IV	.	.	V²	V	IV	IV²	III	II	.	V	V	V²	V²	V²
Viola dactyloides	-hl	I	IV	IV	II	I	II	V	IV	III	V	.	II	.	I	IV	.	I
Artemisia integrifolia	-hl	.	III	V	IV	.	II	+	.	.	V	IV	IV²	V	IV	V	III	V
Synurus deltoides	-hl	.	IV	V	I	.	IV	+	.	.	V	IV	IV	V	V	IV	.	IV
Sedum aizoon	-hl	V	V	V	IV	II	V	II	II	I	V	V	II	V	III	III	II	V
Adenophora tricuspidata	-hl	V	V²	V²	.	I	V	I	.	+	V	III	.	IV	V	V	I	IV
Lilium pensylvanicum	-hl	.	IV	V	II	.	II	II	II	II	IV	I	IV	IV	IV	III	IV	V
Aster tataricus	-hl	.	III	V	II	IV	V	I	.	+	V	.	IV²	IV	II	III	I	.
Seseli seseloides	-hl	.	V	V	.	I	V	I	.	+	III	I	.	V	II	V	.	V
Geranium eriostemon	-hl	.	V	III	.	.	V	V	IV	V	V	V	.	V	V	V	IV	V
Elymus confusus	-hl	III	II	II	.	.	V²	IV	II	III	III	.	.	I	IV²	IV²	II	IV
Adenophora sublata	-hl	.	V²	III²	+	.	+	.	.	.	IV²	V²	II	.	IV²	II	.	.
Adenophora pereskiifolia	-hl	.	IV	II	.	.	I	.	.	.	III	IV	.	II	II	I	.	.
Patrinia scabiosifolia	-hl	.	IV²	V²	II	I	III	.	.	.	V²	.	.	V	.	III	.	.
Adenophora coronopifolia	-hl	.	IV	II	.	.	III	I	.	.	I	I	.	II	III	II	.	II
Calamagrostis brachytricha	-hl	V²	V²	V	I	.	.	.	.	.	V	I	I	.	.	.	.	.
Campanula cephalotes	-hl	III	V	V	.	.	.	II	.	I	V	.	.	.	.	.	I	II
Rosa davurica	-s1	.	II	IV	I	V²	IV	r	.	.	IV	IV	IV	.	II	I	.	.

Table X (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Other species:																		
Artemisia tanacetifolia	-hl	V²	V	V²	IV²	V²	V²	V²	IV²	V²	V	V	V²	V²	V²	V²	V	V
Lupinaster pentaphyllus	-hl	V	V	IV	V	V	V	V	V	V	IV	III	V	V	V	V	I	IV
Lathyrus humilis	-hl	I	V	V	III²	V	V²	V²	V²	V²	IV	V	IV²	V²	V²	V²	V²	IV²
Sanguisorba officinalis	-hl	V	V²	V	IV	V	V	V	V	V	V	V	V	V	V²	V	V	V
Hieracium umbellatum	-hl	IV	V	V	.	.	V	V	V	V	IV	V	I	V	IV	V	IV	V
Galium boreale	-hl	I	IV	IV	III	.	IV	IV	III	IV	V	V	V	V	V	V	IV	V
Spiraea media	-s1	.	V	V	II²	.	IV²	IV	III	III	V	V²	IV	V	IV	V	V²	V²
Carex amgunensis	-hl	.	IV²	V²	.	II	V²	V	IV²	IV²	V²	V²	.	V²	V²	V²	IV	II
Thalictrum appendiculatum	-hl	III	V	V	.	II	V	II	.	II	V	.	.	V²	V²	V	I	II
Festuca ovina	-hl	III	IV	V	.	.	V	II	.	II	IV	II	.	V	IV	IV	II	II
Vicia amoena	-hl	.	.	I	.	II	III	III	II	II	III	IV	.	V	V	V	V	V
Cypripedium guttatum	-hl	.	I	.	II	.	III	III	+	III	.	III	IV²	V	V	V	I	IV
Rubus saxatilis	-hl	.	III	III	.	.	II	IV	+	III	IV	V	.	IV²	V²	II	IV	IV²
Chamaenerion angustifolium	-hl	.	II	II	III	.	.	II	II	+	III	III	IV²	III	III	I	III	II
Rosa acicularis	-s1	.	II	IV	.	.	IV²	III	III	III	III	II	.	.	IV	IV²	V	II
Elymus gmelinii	-hl	.	III	V	I	IV	IV	II	IV	III	III	.	.	.	.	.	II	I
Betula platyphylla	-s1	.	IV	II	II	III	II	II	I	III	III	II	I	.	.	II	IV	II
Populus tremula	-s1	.	.	II	III	.	.	II	.	III	IV	IV	IV	II	IV	IV	III	.
Silene repens	-hl	.	II	I	.	I	I	+	II	+	II	.	.	.	II	II	.	.
Cypripedium macranthon	-hl	.	I	II	.	.	.	III	+	II	III	.	II	.	.	II	+	I
Adenophora verticillata	-hl	.	IV	II	.	.	.	.	.	.	V	V²	.	.	.	.	.	.
Achnatherum confusum	-hl	.	II	I	.	II	II	I	II	I	.	.	.	.	.	.	.	.
Allium anisopodium	-hl	.	.	.	.	IV	III	.	.	.	.	.	.	.	.	II	.	.
Pinus sylvestris	-s1	.	.	.	.	IV	.	III	III	II	.	.	.	.	.	II	I	.
Neottianthe cucullata	-hl	.	I	.	.	II	.	II	.	III	I	+	.	.	.	I	+	II
Serratula centauroides	-hl	III	III	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scutellaria scordiifolia	-hl	III	II	II	.	.	.	+	I	.	+	.	.	.	.	.	.	.
Scorzonera austriaca	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.
Dracocephalum ruyschiana	-hl	.	.	.	.	.	.	II	II	III	.	.	.	.	.	.	II	.
Atragene sibirica	-hl	.	+	.	.	.	+	II	+	III	.	III	.	.	I	.	II	II
Achillea asiatica	-hl	.	I	+	.	.	.	+	+	+	.	.	.	.	.	.	III	IV
Heteropappus hispidus	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Leontopodium conglobatum	-hl	II	.	.	.	.	.	+	I	.	.	.	.	.	.	.	.	I
Woodsia ilvensis	-hl	II	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Scutellaria baicalensis	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hypericum attenuatum	-hl	II	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Hieracium x *robustum*	-hl	II	I	+	.	.	.	r	+	.	.	.	.	.	.	.	.	.
Artemisia dubia	-hl	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Erysimum amurense	-hl	.	.	.	II	.	.	.	.	.	.	.	I	.	.	.	.	.
Saussurea neoserrata	-hl	.	.	.	II	.	.	.	.	.	.	.	II	.	.	.	.	.
Potentilla acervata	-hl	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Allium senescens	-hl	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Geranium transbaicalicum	-hl	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.
Helictotrichon hookeri	-hl	.	.	.	.	.	.	II	II	+	.	.	.	.	.	.	.	I
Pedicularis rubens	-hl	I	I	+	.	.	.	II	+	II	.	.	.	.	.	.	.	.
Vicia nervata	-hl	.	.	.	.	.	.	I	II	+	.	.	.	.	.	I	.	.
Androsace septentrionalis	-hl	I	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.
Artemisia leucophylla	-hl	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.
Thalictrum foetidum	-hl	.	.	.	.	.	.	r	II	II	.	.	.	.	I	I	+	.
Elymus transbaicalensis	-hl	.	+	I	.	I	.	I	II	+	+	.	.	.	II	II	.	.
Phlomoides tuberosa	-hl	.	.	+	.	.	.	+	II	+	I	.	.	.	.	.	.	.
Trommsdorfia maculata	-hl	.	.	.	.	.	.	I	II	.	.	.	.	.	.	I	.	.
Ptilium crista-castrensis	-ml	.	.	.	.	.	.	r	+	II	.	.	.	.	.	.	+	.
Pleurozium schreberi	-ml	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	+	.
Pinus sibirica	-s1	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.
Hieracium virosum	-hl	.	.	.	.	.	.	I	+	II	.	.	.	.	.	.	.	.
Aconogonon alpinum	-hl	.	.	+	.	.	.	.	.	.	II	+	.	.	.	.	.	.
Orthilia secunda	-hl	.	+	.	.	.	.	+	I	+	I	II	.	.	.	.	.	.
Paris verticillata	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	II	.
Equisetum sylvaticum	-hl	.	.	+	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Athyrium filix-femina	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Ptarmica impatiens	-hl	.	+	.	.	.	.	.	.	.	.	II	.	.	.	.	+	.
Lespedeza bicolor	-s2	.	.	.	I	.	.	.	.	.	.	.	II	.	.	.	.	.
Valeriana amurensis	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.

Table X (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Pulsatilla multifida	-hl	.	.	.	I	.	.	.	.	.	.	.	II	.	.	.	.	.
Angelica dahurica	-hl	.	.	.	+	.	.	.	.	.	.	.	II	.	.	.	.	.
Pedicularis labradorica	-hl	.	.	.	+	.	.	II	.	I	.	.	II	.	.	.	I	.
Angelica maximowiczii	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Saussurea umbrosa	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Fritillaria maximowiczi	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Pulsatilla dahurica	-hl	.	.	.	+	.	.	.	.	.	.	.	II	.	.	.	.	.
Helictotrichon pubescens	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.
Aconitum septentrionale	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Viola mauritii	-hl	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	II	.
Geum aleppicum	-hl	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	II	II
Agrimonia pilosa	-hl	I	I	I	.	.	.	+	+	+	.	.	.	.	.	.	II	II
Thalictrum simplex	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Delphinium crassifolium	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Lilium pilosiusculum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Dianthus superbus	-hl	.	.	.	.	.	.	I	+	.	.	.	.	.	.	.	I	II
Betula fruticosa	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Plantago depressa	-hl	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	II
Heracleum dissectum	-hl	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I	+	II

Species with few occurrences:

Abietinella abietina (ml) - 2(I), *Aconitum volubile* (hl) - 12(I), *Aconogonon valerii* (hl) - 4(I), *Anemone sylvestris* (hl) - 6(+), *Anemonoides altaica* (hl) - 16(I), *A. reflexa* (hl) - 16(I), *Antennaria dioica* (hl) - 7(+), 9(+), *Aquilegia sibirica* (hl) - 16(+), *Armeniaca sibirica* (s1) - 5(I), *Artemisia vulgaris* (hl) - 1(I), *Asterothamnus fruticosus* (hl) - 8(+), *Astragalus inopinatus* (hl) - 8(+), *Atragene macropetala* (hl) - 4(I), *Aulacomnium turgidum* (ml) - 9(I), 16(+), *Berberis amurensis* (s1) - 12(I), *Bistorta major* (hl) - 14(I), *Botrychium lunaria* (hl) - 6(+), 7(+), 9(+), 15(I), *Brachypodium pinnatum* (hl) - 7(+), 8(+), *Calamagrostis pavlovii* (hl) - 7(+), 15(I), *Carex argunensis* (hl) - 9(+), *C. delicata* (hl) - 17(I), *C. globularis* (hl) - 17(I), *C. korshinskyi* (hl) - 1(I), *C. media* (hl) - 17(I), *Cimicifuga foetida* (hl) - 9(I), 16(+), *Clausia aprica* (hl) - 8(+), *Corallorrhiza trifida* (hl) - 6(+), *Crataegus dahurica* (s1) - 3(+), 11(I), *Cypripedium calceolus* (hl) - 12(I), *Delphinium grandiflorum* (hl) - 1(I), 4(+), *Dicranum fuscescens* (ml) - 4(+), *D. species* (ml) - 9(I), 16(+), *Dontostemon dentatus* (hl) - 4(+), *Duschekia fruticosa* (s1) - 12(I), *Elymus caninus* (hl) - 13(I), 14(I), *E. ciliaris* (hl) - 4(I), *Elytrigia repens* (hl) - 6(I), 8(+), 17(I), *Epipactis helleborine* (hl) - 8(+), *Erigeron acris* (hl) - 3(+), *Festuca rubra* (hl) - 17(I), *Galatella angustissima* (hl) - 8(+), *Galeopsis bifida* (hl) - 2(+), *Gentianella amarella* (hl) - 8(+), 17(I), *Gentianopsis barbata* (hl) - 3(+), 17(I), *Goodyera repens* (hl) - 9(+), *Gymnocarpium dryopteris* (hl) - 11(I), *Heteropappus altaicus* (hl) - 16(+), *Hieracium echioides* (hl) - 8(+), *Hierochloe odorata* (hl) - 16(+), *Hylocomium splendens* (ml) - 9(+), *Ixeridium gramineum* (hl) - 8(+), *Lathyrus pratensis* (hl) - 16(+), *Ledum palustre* (hl) - 16(+), *Lonicera edulis* (s1) - 16(+), *Luzula rufescens* (hl) - 8(+), 12(I), 13(I), 16(+), *Lychnis sibirica* (hl) - 1(I), *Myosotis imitata* (hl) - 16(I), *Orostachys malachophylla* (hl) - 1(I), 4(I), 12(I), *O. spinosa* (hl) - 4(I), *Orthilia obtusata* (hl) - 16(+), *Oxytropis grandiflora* (hl) - 1(I), *O. strobilacea* (hl) - 7 (+), 8(I), *Padus avium* (s1) - 2(+), *Pardanthopsis dichotoma* (hl) - 1(I), *Pedicularis sceptrum-carolinum* (hl) - 11(I), 17(I), *P. spicata* (hl) - 17(I), *Phlox sibirica* (hl) - 7(+), *Platanthera bifolia* (hl) - 7(+), 9(I), *P. freynii* (hl) - 3(I), *Polygala comosa* (hl) - 7(+), *Polytrichum species* (ml) - 7(I), 9(+), 11(I), 16(+), *Potentilla bifurca* (hl) - 8(+), *P. matsuokana* (hl) - 7(I), *Pseudostellaria sylvatica* (hl) - 4(I), 12(I), *Rhamnus davurica* (s1) - 11(I), *Rhytidiadelphus triquetrus* (ml) - 11(+), *Ribes pauciflorum* (s1) - 12(I), *Rubus arcticus* (hl) - 12(I), *R. idaeus* (s1) - 12(I), *R. matsumuranus* (s1) - 11(+), *Salix bebbiana* (s1) - 7(I), 9(+), 16(+), *S. rhamnifolia* (s1) - 7(+), 17(I), *S. taraikensis* (s1) - 12(I), *Saussurea amurensis* (hl) - 11(I), *S. controversa* (hl) - 8(+), *S. parviflora* (hl) - 16(I), *Saxifraga cernua* (hl) - 17(I), *S. sibirica* (hl) - 4(+), *Selaginella rupestris* (hl) - 4(+), *Senecio nemorensis* (hl) - 11(I), *Silene aprica* (hl) - 4(I), *S. firma* (hl) - 12(I), *Spiraea flexuosa* (s1) - 7(+), 9(+), *S. salicifolia* (s1) - 13(I), 16(+), *S. sericea* (s1) - 7(+), *Stipa baicalensis* (hl) - 1(I), *Taraxacum officinale* (hl) – 7(+), 16(+), 17(I), *Tephroseris integrifolia* (hl) - 7(+), 9(I), 16(+), *Thymus dahuricus* (hl) - 1(I), 4(I), *Tilia amurensis* (t1) - 4(I), *Vaccinium uliginosum* (hl) - 11(I), 12(I), *Veronica incana* (hl) - 8(+), *Vicia japonica* (hl) - 11(I), *Viola selkirkii* (hl) - 10(+), 11(+), *V. variegata* (hl) - 1(I), 2(+), 3(I), *Woodsia subintermedia* (hl) - 4(+), *Zigadenus sibiricus* (hl) - 12(I).

Table XI — Order *Festuco ovinae-Laricetalia sibiricae*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Mean altitude (m)		1750	2010	2110	1830	2200	2260	2380	2130	1980	2200	1970	2090	2410	-	-	-	-	1690	-	-	-	-	1750
Mean cover of tree layer %		52	50	62	53	54	54	45	55	54	46	56	56	67	-	-	-	-	56	-	-	-	-	55
Mean cover of shrub layer %		10	20	8	18	5	1	1	17	20	19	4	2	0	-	-	-	-	2	-	-	-	-	3
Mean cover of herb layer %		64	74	51	77	66	54	51	66	73	64	56	67	70	-	-	-	-	67	-	-	-	-	62
Mean cover of moss layer %		25	6	79	21	34	35	26	26	15	20	38	20	25	-	-	-	-	2	-	-	-	-	10
Mean heigt of tree layer (m)		22	18	13	19	14	17	13	18	17	18	22	21	-	-	-	-	-	25	-	-	-	-	22
Mean heigh of shrub layer (cm)		120	120	90	110	100	90	40	46	48	48	40	42	-	-	-	-	-	47	-	-	-	-	43
Mean height of herb layer (cm)		36	38	38	40	36	36	40	30	32	28	30	31	-	-	-	-	-	41	-	-	-	-	40
Mean nr. of species in one relevé		39	42	43	45	43	47	45	50	51	47	39	33	30	-	-	-	-	46	-	-	-	-	44
Relevé area (m^2)		200	200	200	200	200	200	200	200	200	200	450	450	-	-	-	-	-	450	-	-	-	-	450
Number of species		109	84	77	68	75	81	88	93	94	69	130	112	71	43	31	39	81	112	62	80	49	52	68
Number of relevés		21	10	7	6	9	6	10	6	6	5	17	9	12	8	25	8	47	10	10	16	8	11	8
Main species of tree layer																								
Larix sibirica	-t1	V^4	V^3	V^4	V^4	V^4	V^4	V^4	V^3	V^4	V^4	V^4	V^4	V^4	V	V	V	V^4	V^3	V	V	V	II	V^3
D.S. Ass. ***Thesio repentis-Laricetum sibiricae*** = D.S. All. ***Irido-Laricion sibiricae***																								
Elymus sajanensis	-hl	III	IV	III	V	V	I	.	III	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Caragana arborescens	-s1	IV^2	V^3	I	IV^2	.	.	.	V^2	IV^2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Viola arenaria	-hl	V	III	V	I	.	.	.	IV	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hylocomium splendens	-ml	III	+	II	IV	.	.	.	.	.	.	I	I	.	.	.	.	.	.	.	.	.	.	.
Gentiana macrophylla	-hl	II	III	II	V	.	I	+	I	.	.	+	I	II	.	.	.	I	.	II	.	.	.	.
Poa urssulensis	-hl	+	III	V	III	I	.	IV	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Iris ruthenica	-hl	III^2	IV	.	V^2	.	.	.	.	III	.	I	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia macrantha	-hl	I	V^2	II	V	IV	II	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Paeonia anomala	-hl	IV^2	IV	III	.	.	.	.	.	.	.	I	I	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***T.r.-L.s. typicum***																								
Vicia nervata	-hl	V	.	I	.	.	.	.	.	.	.	.	.	V	.	.	.	II	.	.	.	.	IV	III
Picea obovata	-s1	IV	.	.	.	.	.	.	II	I	III	.	.	.	.	.	.	.	.	.	II	.	.	.
Viola dissecta	-hl	III	.	.	.	II	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***T.r.-L.s. rosetosum pimpinellifoliae***																								
Vaccinium vitis-idaea	-hl	II	V^2	.	I	.	.	.	.	.	.	I	I	.	.	.	.	.	I	.	.	.	.	.
Spiraea media	-s1	I	IV	.	I	.	.	+	.	I	.	II	III	.	.	.	IV	II	IV	III	II	I	V	IV
Rosa pimpinellifolia	-s1	.	III	.	.	.	.	.	IV	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Allium strictum	-hl	.	III	.	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	I	.	.	.	.	.
D.S. Subass. ***T.r.-L.s. adenophoretosum lamarckii***																								
Adenophora lamarckii	-hl	.	.	V	.	.	.	V	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	IV^1
Elytrigia gmelinii	-hl	.	.	IV	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anemone sylvestris	-hl	+	+	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia santolinifolia	-hl	.	.	III	.	.	.	.	II	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stellaria bungeana	-hl	II	I	III	.	.	.	I	.	.	.	.	I	.	.	.	V	.	.	.	.	.	.	.
Rhododendron dauricum	-s1	+	.	III^2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
D.S. Subass. ***T.r.-L.s. hedysaretosum neglecti***																								
Pleurozium schreberi	-ml	I	.	I	V	.	.	.	II	.	.	I	I	.	.	.	.	.	I	.	.	.	.	.
Melilotoides platycarpos	-hl	+	I	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Solidago virgaurea	-hl	.	II	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geranium albiflorum	-hl	+	.	.	V	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Astragalus pendulinus	-hl	.	I	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Kobresio myosuroidis-Laricetum sibiricae***																								
Kobresia myosuroides	-hl	.	.	.	.	IV	IV	V^2	.	.	.	I	I	.	V	.	.	.	.	.	.	I	.	.
Saussurea alpina	-hl	+	+	.	II	III	V	II	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pedicularis compacta	-hl	.	.	.	.	III	V	III	I	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.
Pedicularis verticillata	-hl	.	.	.	.	V	II	IV	I	I	.	IV	II	.	.	.	.	.	.	.	.	.	.	.
Hedysarum inundatum	-hl	.	.	I	.	III	.	V	.	.	.	II	.	II	.	III	.	I	.	.	I	V	.	.
Androsace septentrionalis	-hl	.	.	.	.	IV	.	III	.	I	.	.	.	IV	.	.	.	.	.	.	.	.	.	.
Helictotrichon hookeri	-hl	.	.	.	.	IV	I	III	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Pedicularis lasiostachys	-hl	.	.	.	.	IV	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Draba cana	-hl	.	.	.	.	III	IV	+	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.
Aulacospermum anomalum	-hl	.	.	.	I	IV	III^2	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca rubra	-hl	I	.	.	.	.	IV	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table XI (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Primula algida	-hl	.	.	.	.	.	III	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***K.m.-L.s. dryadetosum oxyodontae***																								
Astragalus alpinus	-hl	.	.	.	.	III	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dryas oxyodonta	-hl	.	.	.	.	.	IV	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus monophyllus	-hl	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	.	.
Arctous erythrocarpa	-hl	.	.	.	.	.	III	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.
Trisetum spicatum	-hl	.	.	.	.	I	III	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S.Subass. ***K.m.-L.s. hedysaretosum inundati***																								
Saxifraga hirculus	-hl	.	.	.	.	.	.	III	.	.	.	I	.	.	.	.	.	.	.	.	.	III	.	.
Melilotoides ruthenica	-hl	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Peucedanum vaginatum	-hl	.	.	II	.	.	.	III	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Gentianella amarella	-hl	+	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Astragalus frigidus	-hl	.	.	.	II	I	I	III	.	.	.	IV	I	.	.	.	.	.	.	.	.	.	.	.
Pulsatilla turczaninovii	-hl	.	.	.	.	I	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
D.S. Ass. ***Spiraeo chamaedryfoliae-Laricetum sibiricae***																								
Spiraea chamaedryfolia	-s1	IV	V	V^2	IV	I	I	II	V^2	V^2	V	.	.	.	.	.	.	.	.	.	.	.	.	.
Lilium pilosiusculum	-hl	V	V	V	V	.	.	.	V	V	IV	I	IV	.	.	.	III	I	II	.	I	.	.	.
Cotoneaster uniflorus	-s2	III	V^2	V	V^2	.	IV	.	V^2	V^3	V^2	.	.	.	.	.	.	.	.	.	.	.	.	.
Thesium repens	-hl	V	V	.	IV	I	.	.	V	III	III	+	.	.	.	.	.	.	I	.	.	.	.	.
Aquilegia sibirica	-hl	III	.	IV	III	.	.	.	V	II	V	II	III	.	.	.	V	II	.	.	I	.	I	.
Moehringia lateriflora	-hl	.	IV	V	V	.	II	.	V	IV	III	I	I	.	.	.	.	I	II	+	II	I	II	.
Campanula rotundifolia	-hl	.	+	V	.	.	.	.	V	IV	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Pedicularis elata	-hl	.	III	.	III	.	.	.	IV	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***S.ch.-L.s. cicerbitetosum azureae***																								
Cicerbita azurea	-hl	.	.	.	IV	.	.	.	V^2	I	.	.	II	.	.	.	.	.	.	.	.	.	.	.
Heracleum dissectum	-hl	+	.	.	.	.	.	.	V	.	.	.	III	.	.	II	.	I	.	.	II	.	.	.
Ribes nigrum	-s1	.	.	.	.	.	.	.	IV	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.
Aconitum altaicum	-hl	.	.	.	.	.	V	.	III	.	I	I	I	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***S.ch.-L.s. colurietosum geoidis***																								
Helictotrichon schellianum	-hl	.	.	.	.	.	.	I	I	V^2	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Veronica porphyriana	-hl	.	+	.	.	.	.	.	.	V	II	.	.	.	.	.	.	.	.	.	.	.	.	.
Cotoneaster melanocarpus	-s1	III	.	III	.	.	.	.	.	V	.	I	III	.	.	.	III	I	I	I	.	.	V	.
Astragalus adsurgens	-hl	.	.	.	I	II	.	III	I	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Coluria geoides	-hl	.	.	I	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Koeleria altaica	-hl	.	.	.	.	.	.	IV	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Serratula marginata	-hl	.	I	.	.	.	.	.	I	IV	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Artemisia obtusiloba	-hl	.	.	.	.	.	I	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dianthus versicolor	-hl	.	.	.	.	.	.	II	.	III	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Allium nutans	-hl	.	+	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***S.ch.- L.s. empetretosum nigri***																								
Empetrum nigrum	-hl	.	.	.	.	.	.	.	.	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.
Bistorta major	-hl	.	.	.	.	.	I	.	.	.	V	.	I	.	.	.	.	.	.	.	.	.	.	.
Bergenia crassifolia	-hl	.	.	.	.	.	.	.	II	I	IV	.	.	.	.	.	.	.	.	.	.	.	.	.
Pinus sibirica	-s1	III	IV	.	.	.	.	.	II	II	IV	.	I	.	.	.	.	I	.	II	+	.	III	.
D.S. Ass. ***Festuco altaicae-Laricetum sibiricae*** = D.S. Suball. ***Festuco altaicae-Laricenion sibiricae***																								
Calamagrostis pavlovii	-hl	V^2	.	I	.	.	.	.	V^2	I	.	III	III^2	.	.	.	.	.	.	.	.	.	.	.
Cerastium pauciflorum	-hl	III	.	.	.	.	.	II	.	.	.	III	IV	.	.	.	.	.	.	.	.	.	.	.
Festuca altaica	-hl	.	.	II	.	III	III	.	V^2	.	V^2	IV^2	V	.	II	.	.	I	.	.	.	II	.	.
Saussurea stubendorffii	-hl	.	.	.	.	.	.	.	.	.	.	IV	III	.	.	.	.	.	I	.	.	.	.	.
Ranunculus propinquus	-hl	.	.	.	.	.	.	.	I	.	.	IV	II	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***F.a.-L.s. delphinietosum crassifolii***																								
Delphinium crassifolius	-hl	I	.	.	.	.	.	III	.	.	.	I	III	.	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Poo sibiricae-Laricetum sibiricae***																								
Rhodiola rosea	-hl	.	.	.	.	.	.	.	.	.	.	.	I	V	I	.	.	I	.	II	I	.	.	.
Poa transbaicalica	-hl	.	.	.	.	.	.	.	.	.	I	.	.	IV	.	.	.	.	.	.	.	.	.	.
Tephroseris integrifolia	-hl	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.

Table XI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Pedicularis amoena	-hl	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.
Pulsatilla ambigua	-hl	.	.	.	.	.	.	.	.	.	.	.	.	IV²	.	.	.	.	.	.	.	.	.	.
Saxifraga sibirica	-hl	.	.	.	.	.	.	II	.	.	.	.	I	III	.	.	.	.	.	.	.	.	.	.
Cerastium arvense	-hl	.	.	.	II	III	.	I	I	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Aconogonon angustifolium	-hl	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Ranunculus pedatifidus	-hl	.	.	.	.	.	.	+	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Pentaphyllo fruticosae-Laricetum sibiricae***																								
Pentaphylloides fruticosa	-s1	.	.	.	.	.	.	+	.	.	.	II	I	III	II	V	.	I	I	+	II	III	.	.
Geranium transbaicalicum	-hl	.	.	.	.	.	.	.	.	.	.	+	II	.	.	IV	.	.	+	.	.	.	.	.
Ribes rubrum	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.
D.S. Ass. ***Geranio pseudosibiricae-Laricetum sibiricae***																								
Ranunculus japonicus	-hl	I	.	.	.	.	.	.	.	.	.	.	.	.	II	II	II	III	V	II	IV	II	I	.
Aegopodium alpestre	-hl	.	V²	.	V²	.	V²	.	V²	I	V²	IV	.	.	II	.	.	III	V	IV	IV	V	+	.
Trollius asiaticus	-hl	.	.	.	II	.	II	II	.	.	II	III	II	.	IV	II	I	II	V	III	V	V	.	.
Equisetum pratense	-hl	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	III	II	III	V	.	.
Vicia venosa incl. var. *baicalensis*	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	V²	.	III	.	.	.
D.S. Subass. ***G.p.-L.s. aconitetosum barbati*** Variant ***Crepis sibirica***																								
Crepis sibirica	-hl	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	I	.	.	.
Vicia amoena	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	IV	+	.	.	.
Artemisia mongolica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	I	.	III	I	.	.	.
Achillea asiatica	-hl	II	II	III	IV	.	II	.	.	I	.	+	II	.	.	.	.	I	I	III	I	.	.	.
D.S. Subass. ***G.p.-L.s. cacalietosum hastatae***																								
Aconitum turczanonovii	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	I	I	.	III	V	II	.	.
Aconitum septentriona	-hl	.	.	.	.	.	.	.	I	.	.	I	II²	.	.	.	.	.	I	.	V	.	.	.
Senecio nemorensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	I	.	III	.	.	.
Cacalia hastata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	III	.	.	.
Calamagrostis langsdorffii incl. *C. purpurea*	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	I	I	.	III	.	.	.
Artemisia frigida	-hl	.	.	.	.	.	.	.	.	.	.	.	I	.	IV	.	.	.	.	+	III	V	.	.
D.S. Subass. ***G.p.-L.s. calthetosum palustris***																								
Caltha palustris	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	V	.	.
Carex orbicularis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	.
Saxifraga punctata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.
Pedicularis oederi	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.
D.S. Ass. ***Betulo platyphyllae-Populetum tremulae***																								
Populus tremula	-t1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	I	I	+	V³	.	.
Elymus mutabilis	-hl	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	IV	.	.
Rubus saxatilis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	I	II	.	III	.	I
Sedum aizoon	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	III	.	.
D.S. Ass. ***Vicio unijugae-Laricetum sibiricae***																								
Astragalus membranaceus	-hl	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	V²
Vicia unijuga	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V²
Elymus dahuricus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	IV
Myosotis sylvatica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	IV
D.S. Suball. ***Fragario orientalis-Laricenion sibiricae***																								
Fragaria orientalis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	V²	III	IV	I	IV	V²
Betula platyphylla	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	III	II	II	I	V	II
Artemisia sericea	-hl	.	I	.	I	.	.	+	.	.	.	+	.	.	.	.	.	II	IV	IV	I	.	V	V¹
Saussurea elongata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	I	II	II	.	I	.	.	V
Viola uniflora	-hl	.	.	.	.	.	.	.	.	.	.	I	I	.	.	.	.	I	V¹	IV	III	.	+	.
Polemonium chinense	-hl	+	.	I	.	.	.	.	.	.	.	.	.	.	I	.	.	.	V	III	II	III	.	I
Geranium eriostemon	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	.	.	.	.	III
Carex lanceolata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	IV²
Elymus gmelinii	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	III	+	.	III	.
Dracocephalum grandiflorum	-hl	.	.	.	.	.	.	.	.	.	.	.	I	.	I	.	.	.	II	III	+	.	.	.

Table XI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
D.S. All. ***Pachypleuro alpini-Laricion sibiricae***																								
Poa attenuata	-hl	.	.	IV	.	III	IV	IV	V²	V²	V	I	I	+	.	.	.	I	.	II	.	.	I	.
Tephroseris praticola	-hl	+	+	.	II	IV	V	IV	V	III	V	.	.	.	.	.	.	.	.	.	.	.	.	.
Oxytropis ambigua	-hl	I	V	.	IV	V	V	V	II	V	III	+	.	.	.	.	.	.	.	.	.	.	.	.
Hedysarum neglectum	-hl	.	+	.	V²	V²	V²	.	V²	IV	V	.	I	.	.	.	.	.	.	.	.	.	.	.
Polemonium pulchellum	-hl	.	.	IV²	.	I	V	.	V	V	IV	III	I	.	.	.	.	.	.	.	.	.	.	.
Festuca kryloviana	-hl	.	.	.	.	V²	V²	.	IV	IV	V	II	.	.	.	.	.	.	.	.	.	.	.	.
Draba sibirica	-hl	.	II	.	.	I	V	.	IV	IV	I	.	.	.	.	.	.	.	.	.	.	.	.	.
Gentiana decumbens	-hl	.	+	I	.	IV	I	I	.	V	III	.	I	II	.	.	.	.	.	.	.	.	.	.
Pachypleurum alpinum	-hl	.	.	.	.	V	V	IV	III	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex obtusata	-hl	I	.	I	.	II	IV	III	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene chamarensis	-hl	.	.	.	.	II	II	V	III	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Allium splendens	-hl	+	.	.	.	IV	.	III	V	.	III	I	II	II	.	.	.	.	.	.	.	.	.	.
Stellaria peduncularis	-hl	.	.	.	.	IV	V	II	I	.	III	.	.	.	.	II	I	I	.	.	.	II	.	.
Myosotis asiatica	-hl	.	I	.	.	V	V	V	.	V	I	II	.	.	.	.	.	.	.	.	.	.	.	.
Juniperus pseudosabina	-s2	.	+	.	.	.	V	.	.	III	III	.	.	.	.	.	.	.	.	.	.	.	.	.
Juniperus sibirica	-s2	.	+	.	.	.	I	.	I	V	V	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. All. ***Festuco altaicae-Laricion sibiricae***																								
Campanula turczaninovii	-hl	V	.	.	.	.	.	.	.	.	.	V	II	IV²	V	.	.	III	V	I	III	.	I	IV
Lathyrus humilis	-hl	III²	.	.	.	.	.	.	.	.	.	V²	III²	+	.	.	V	III	V²	.	I	.	IV	V²
Vicia cracca	-hl	IV	+	V	.	.	.	.	.	.	.	V	V	.	IV	IV	V	IV	V	III	III	II	II	III
Anemonastrum crinitum	-hl	.	.	.	.	.	.	.	.	.	.	IV	.	V	V	.	.	V	IV	IV	I	III	+	IV
Valeriana alternifolia	-hl	+	.	I	.	.	.	.	.	.	.	IV	II	.	II	III	.	II	III	IV	II	I	III	V
Dendranthema zawadskii	-hl	.	.	.	.	.	.	.	I	.	.	IV	.	IV	IV	.	V	V	IV	V	+	.	V	V
Sanguisorba officinalis	-hl	+	.	.	.	.	.	.	.	.	.	III	.	V	III	V	.	III	V	V	IV	I	IV	V
Pedicularis rubens	-hl	.	.	.	.	.	.	.	.	.	.	II	I	V²	II	.	IV	III	II	.	+	I	.	IV
Artemisia laciniata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	III	V	II	.	IV	I	.	V	.
D.S. Ord. ***Festuco ovinae-Laricetalia sibiricae***																								
Festuca ovina	-hl	III	V	V²	IV	V	V	V²	V	V	V	V²	IV²	IV²	V	.	II	IV	V²	IV	III	V	III	V
Bromopsis pumpelliana	-hl	V	V²	V	V²	III	V	V	I²	I	.	IV	IV²	I	II	I	III	III	IV	IV	II	.	IV	V
Dianthus superbus	-hl	IV	II	V	V	V	V	III	V	V	V	II	V	.	.	.	V	I	.	II	II	.	.	.
Carex amgunensis	-hl	V²	.	IV	.	V²	V²	.	.	III	II	IV²	III²	II	I	.	IV	III	V²	IV	I	.	IV	II
Bistorta vivipara	-hl	II	.	II	III	IV	V	V	I	.	IV	V²	III	III	V	V	II	IV	II	I	IV	V	.	II
Trisetum sibiricum	-hl	IV	IV	III	IV	IV	IV	IV	III	I	I	III	IV	IV²	II	III	V	II	IV	II	II	I	.	III
Lonicera altaica	-s1	I	V	V	V²	III	V	.	V	I	V	II	III	.	.	III	V	I	.	.	I	I	.	.
D.S. Cl. ***Rhytidio rugosi-Laricetea sibiricae***																								
Poa sibirica	-hl	V²	V	V²	V²	V²	V²	V²	V	V	V²	V²	V²	IV	V	V	V	V	V¹	IV	IV	IV	I	V
Aconitum barbatum	-hl	IV	V²	V	V	V²	I	V	I	I	.	V	IV	.	II	.	V	IV	V	V	I	.	IV	IV
Carex pediformis incl. *C. kirilowii*	-hl	III²	V²	V²	V²	V²	V²	II	V²	V²	V²	II	II	II	II	.	.	I	II	.	+	.	II	.
Rhytidium rugosum	-ml	V³	V³	V³	V³	V³	V³	V³	V³	V³	V²	V³	IV²	V	-	-	-	-	III	-	-	-	-	IV
Thalictrum foetidum	-hl	II	.	IV	V	III²	II	IV²	V	V²	IV	II	II	III²	.	.	.	II	II	.	.	.	III	.
Potentilla matsuokana incl. *P.nivea*	-hl	.	IV	III	.	V	V	V	.	V	IV	III	I	V	.	.	V	IV	I	+	.	I	.	.
Scorzonera radiata	-hl	III	II	III	I	.	.	II	.	II	V	II	II	II	III	.	IV	II	III	III	.	.	III	V
Pulsatilla patens	-hl	+	II	II	IV	I	II	.	I	V	V	II	I	.	.	.	IV	II	III	.	+	II	.	V
Bupleurum multinerve	-hl	+	V	V	V	V	I	V	V	V²	V	.	I	.	.	.	.	.	.	.	.	.	.	.
Galium verum	-hl	II	.	.	.	III	V	V	V	V	V	II	I	V	.	IV	I	II	.	+	+	.	.	.
Aster alpinus	-hl	+	.	IV	.	V	V	V	III	V²	V	II	.	II	II	.	.	II	.	+	.	.	I	I
Abietinella abietina	-ml	II	.	V⁴	.	V	IV	V²	V²	I	II	IV²	III²	III	-	-	-	-	I	-	-	-	-	.
D.S. Cl. ***Vaccinio-Piceetea***																								
Goodyera repens	-hl	III	.	IV	.	.	.	.	.	.	.	.	II	.	.	.	.	.	I	.	.	.	.	.
Calamagrostis obtusata	-hl	.	.	.	.	.	.	.	.	.	.	+	I	.	I	.	II	II	II	II	+	II	.	.
Trientalis europaea	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	II	.	II	.	.	.
Pyrola incarnata	-hl	+	.	I	.	.	I	.	.	.	.	II	I	.	.	.	.	I	III	II	II	I	.	.
Dicranum polysetum	-ml	.	+	.	.	.	.	.	I	.	III	II	I	.	.	.	.	.	I	.	.	.	.	.
Other species:																								
Atragene sibirica	-hl	IV	V	V	V	IV	IV	IV	V²	V²	V	I	I	IV	.	.	V	III	II	III	II	II	V	II
Geranium pseudosibiricum	-hl	V²	V²	III²	V²	II²	II	.	II	IV	II	III	V²	II²	III	.	V	IV	II	V	IV	.	IV	.
Galium boreale	-hl	V	V	V	IV	.	.	.	V	I	.	IV	V	.	II	IV	IV	III	V	V	V	.	V	III
Chamaenerion angustifolium	-hl	III	IV	.	V	II	.	+	V	.	.	IV	II	I	IV	.	IV	III	V¹	V	III	II	III	V

Table XI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Rosa acicularis	-sl	I	II	II	IV	.	.	.	.	.	.	III	II	II	I	.	IV	II	V	III	III	IV	V	II
Lupinaster pentaphyllus	-hl	V	IV	III	V	V	V	III	V	V	III	II	IV	.	.	.	.	I	II	.	I	.	IV	IV
Thalictrum minus	-hl	III	V	III	V^2	.	.	.	I	III	III	I	V^2	.	.	.	.	I	III	IV	III	.	IV	II
Artemisia tanacetifolia	-hl	V	+	V^2	.	V^2	V^2	V^2	.	.	.	III	III	III^2	.	.	.	.	V^1	.	.	.	.	V^2
Saussurea controversa	-hl	IV	II	V	V^2	V^2	.	.	III	V	I	II	III	.	.	III	.	.	.	.	.	V	.	.
Campanula glomerata	-hl	III	.	III	III	.	II	.	III	IV	I	I	I	.	.	.	I	I	I	I	+	.	IV	II
Polygala comosa	-hl	II	V	.	V	.	II	.	V	IV	IV	+	I	.	.	.	.	.	.	.	.	.	.	.
Polemonium coeruleum	-hl	.	IV	.	V	III	I	.	II	.	IV	.	.	.	.	.	.	I	.	.	.	.	.	.
Euphorbia discolor	-hl	I	II	.	.	.	.	.	III	V	III	I	IV	III	.	.	V	I	.	.	.	.	.	.
Oxytropis recognita	-hl	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crepis bungei	-hl	.	.	I	.	III	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Polytrichum species	-ml	+	.	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Myosotis suaveolens	-hl	.	.	.	.	.	.	.	.	.	.	.	.	V	IV	.	IV	II	.	+	I	.	II	.
Poa nemoralis	-hl	.	II	.	I	.	.	.	.	.	I	.	.	.	II	+	.	I	.	+	II	.	III	.
Thalictrum alpinum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	III	.	.	.	.	+	II	.	.
Elymus komarovii	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhodobryum roseum	-ml	II	.	.	.	.	.	.	.	.	.	I	I	.	.	.	.	.	.	.	.	.	.	.
Helictotrichon pubescens	-hl	II	II	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	I	.	.	.	.	.
Potentilla gelida	-hl	II	.	.	.	II	II	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Solidago dahurica	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Veratrum nigrum	-hl	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene repens	-hl	I	II	.	.	II	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pedicularis incarnata	-hl	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aulacomnium turgidum	-ml	+	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Kitagawia baicalensis	-hl	+	.	II	.	.	.	.	II	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dicranum specium	-ml	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Phleum phleoides	-hl	.	+	II	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Delphinium mirabile	-hl	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Coeloglossum viride	-hl	.	.	.	.	II	I	II	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Silene sobolevskajae	-hl	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Papaver nudicaule	-hl	.	.	.	.	I	II	+	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.
Gentiana uniflora	-hl	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca tristis	-hl	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pedicularis semenowii	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Astragalus multicaulis	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aconitum decipiens	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla sericea	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.				.						
Gastrolychnis brachypetala	-hl	.	.	.	.	.	.	II	.	.	.	.	.	+				.						
Saussurea schanginiana	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lonicera hispida	-sl	.	.	.	.	.	.	.	II	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Iris bloudowii	-hl	.	.	.	.	.	.	.	II	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Minuartia verna	-hl	.	.	.	.	.	.	I	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aconogonon alpinum	-hl	.	I	.	.	.	.	I	I	I	II	.	I	.	.	.	.	.	.	.	.	.	.	.
Aulacomnium palustre	-ml	.	.	.	I	I	.	.	I	.	.	II	I	.	.	.	.	.	II	.	.	.	.	I
Stellaria palustris	-hl	.	.	.	.	.	.	.	.	.	.	II	II	.	.	.	.	.	.	.	.	.	.	.
Angelica tenuifolia	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.
Astragalus danicus	-hl	.	I	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.
Hedysarum alpinum	-hl	.	.	.	.	.	.	.	.	.	.	II	I	.	.	.	.	.	.	.	.	.	.	.
Rumex thyrsiflorus	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.
Seseli condensatum	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.
Corydalis sibirica	-hl	+	.	.	.	.	.	.	.	.	.	II	.	+	.	.	.	.	II	.	.	.	.	.
Festuca lenensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Cerastium holosteoides	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Oxytropis strobilacea	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Androsace incana	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Bistorta alopecuroides	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	II
Ligularia sibirica	-hl	.	.	.	.	.	.	.	.	.	.	I	.	.	II	.	.	I	.	.	.	.	.	.
Pleurospermum uralense	-hl	.	.	.	.	.	.	.	.	.	.	.	I	.	II	.	.	I	I	I	II	.	II	.
Pedicularis resupinata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	I	+	+	II	II	I	.
Salix pseudopentandra	-sl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.
Viola rupestris	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	+	.	.	.
Mertensia dahurica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	+	.	.	.
Maianthemum bifolium	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Geranium vlassowianum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	I
Artemisia vulgaris	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	I
Saussurea pseudoalpina	-hl	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	II	.	.	.	.	.

Table XI (continuation)

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Elymus sibiricus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Aconitum volubile	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Viola biflora	-hl	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	II	.	.	.
Peucedanum salinum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	II	I	.	.
Luzula rufescens	-hl	.	.	.	.	.	.	.	.	.	.	I	I	.	.	.	.	.	+	.	.	II	.	.
Eutrema edwardsii	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Claytonia joanneana	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	II	.	.
Rumex acetosa	-hl	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	I	II	.	.
Poa pratensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Saussurea parviflora	-hl	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	II	.	.
Phlomoides tuberosa	-hl	I	+	.	.	.	.	.	I	I	.	.	.	.	.	.	.	I	.	+	.	.	II	.
Cypripedium guttatum	-hl	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	II
Silene sibirica	-hl	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	II
Sedum hybridum	-hl	.	.	I	.	.	.	.	I	I	.	.	.	.	.	.	.	.	I	.	.	.	.	II
Stellera chamaejasme	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Thalictrum petaloideum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	II
Bupleurum scorzonerifolium	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Plantago media	-hl	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	II
Poa angustifolia	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	II
Potentilla fragarioides	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.	II

Species with few occurrences:

Adonis sibirica (hl) - 1(I), *Adoxa moschatellina* (hl) - 1(+), *Agrostis trinii* (hl) - 18(I), *Allium schoenoprasum* (hl) - 11(+), *A. tenuissimum* (hl) - 8(I), *Alopecurus arundinaceus* (hl) - 11(+), *A. pratensis* (hl) - 2(+), *Amblynotus rupestris* (hl) - 13(+), *Anagallidium dichotomum* (hl) - 18(I), *Androsace filiformis* (hl) - 11(+), 12(+), *A. lehmanniana* (hl) - 13(+), *Arabis pendula* (hl) - 8(I), *Artemisia gmelinii* (hl) - 12(I), *Astragalus propinquus* (hl) - 12(I), *A. suffruticos* (hl) - 2(I), *Betula fruticosa* (s1) - 23(I), *Botrychium lunaria* (hl) - 1(+), *Brachythecium salebrosum* (ml) - 18(I), *Bryum species* (ml) - 11(I), *Bupleurum aureum* (hl) - 4(I), *Calamagrostis arundinacea* (hl) - 18(I), 23(I), *C. lapponica* (hl) - 11(+), 12(I), 18(I), *Carex alba* (hl) - 1(+), *C. iljinii* (hl) - 11(+), *Cetraria cucullata* (ml) – 18(I), *Cimicifuga foetida* (hl) - 12(I), *Climacium dendroides* (ml) - 18(I), *Corallorrhiza trifida* (hl) - 1(+), 3(I), 11(+), 18(+), *Delphinium elatum* (hl) - 8(I), *D. laxiflorum* (hl) - 11(+), *Dichodon cerastoides* (hl) - 7(I), *Dicranum brevifolium* (ml) - 18(+), *D. congestum* (ml) - 18(+), *Dracocephalum nutans* (hl) - 9(I), *Elymus confusus* (hl) - 11(I), *Elytrigia repens* (hl) - 2(+), 4(I), *Entodon species* (ml) - 12(I), *Eritrichium villosum* (hl) - 10(I), *Euphrasia parviflora* (hl) - 8(I), 15(I), 18(+), *Equisetum arvense* (hl) - 18(I), *Ferulopsis hystrix* (hl) - 13(I), *Galatella angustissima* (hl) - 9(I), *Galatella hauptii* (hl) – 9(I), *Gentianella azurea* (hl) - 13(+), *Geum aleppicum* (hl) - 18(+), *Grossularia acicularis* (s1) - 9(I), *Gypsophila altissima* (hl) - 8(I), 9(I), *G. sericea* (hl) - 9(I), *Iris humilis* (hl) - 13(+), *Koeleria cristata* (hl) - 9(I), *K. macrantha* (hl) - 13(I), *Lamium album* (hl) - 1(+), *Leontopodium leontopodioides* (hl) - 6(I), 7(I), 13(+), *Ligularia glauca* (hl) - 2(I), *Lomatogonium rotatum* (hl) - 7(+), *Luzula sibirica* (hl) - 12(I), *Malaxis monophyllos* (hl) - 1(+), *Medicago falcata* (hl) - 8(I), *Mertensia davurica* (hl) - 12(I), *Mnium* sp. (ml) - 3(I), *Moneses uniflora* (hl) - 1(+), *Myosotis palustris* (hl) - 11(+), *Noccaea cochleariformis* (hl) - 7(I), *Orostachys malachophylla* (hl) - 13(+), *Orthilia secunda* (hl) - 12(I), *Oxytropis alpina* (hl) - 12(I), *O. deflexa* (hl) - 1(+), *O. myriophylla* (hl) - 11(+), *Parnassia palustris* (hl) - 11(+), *Patrinia rupestris* (hl) - 23(+), *P. sibirica* (hl) - 5(I), 7(I), 11(+), *Pedicularis achilleifoius* (hl) - 13(I), *P. eriantha* (hl) - 23(+), *P. labradorica* (hl) - 11(I), *P. palustris* (hl) - 11(I), 12(I), *P. tristis* (hl) - 11(+), *Pinus sylvestris* (t1) - 23(I), *Plantago depressa* (hl) - 11(I), *Poa botryoides* (hl) - 5(I), 11(+), *P. krylovii* (hl) - 2(+), 4(I), *P. reverdattoi* (hl) - 10(I), *Polygonatum odoratum* (hl) - 12(I), *Polytrichum juniperinum* (ml) - 12(I), *Potentilla chrysantha* (hl) - 2(+), *P. conferta* (hl) - 6(I), *Primula farinosa* (hl) - 18(+), *Ptilidium ciliare* (ml) - 11(I), 12(I), *Ptilium crista-castrensis* (ml) - 1(+), 3(I), 11(I), 18(I), *Pyrola rotundifolia* (hl) - 1(I), *Ranunculus acris* (hl) - 15(I), *Rumex gmelinii* (hl) - 18(+), *Salix bebbiana* (s1) - 8(I), *S. caprea* (s1) - 11(+), 18(+), *S. kochiana* (s1) - 15(I), *Saxifraga cernua* (hl) - 7(I), *S. macrocalyx* (hl) - 5(I), 6(I), *Schizonepeta multifida* (hl) - 1(+), *Senecio praticola* (hl) - 23(I), *Silene jeniseensis* (hl) - 13(+), *Spiranthes amoena* (hl) - 11(+), *Stellaria graminea* (hl) - 11(I), *Swertia obtusa* (hl) - 10(I), *Tanacetum vulgare* (hl) - 12(I), *Taraxacum officinale* (hl) - 2(I), 5(I), 8(I), 11(+), 18(+), *Taraxacum* sp. (hl) - 15(+), *Tephroseris turczaninowii* (hl) - 1(I), *Urtica dioica* (hl) - 18(+), *Veratrum lobelianum* (hl) - 11(+), *Veronica incana* (hl) - 3(I), 7(+), 13(+), *V. krylovii* (hl) - 2(I), *V. longifolia* (hl) - 12(I), 15(I), *Zigadenus sibiricus* (hl) - 11(I),12(I)

Table XII — Order *Carici pediformis-Laricetalia sibiricae*

Column nr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Mean altitude (m)		910	820	1350	650	630	640	1530	1110	1230	1241	650	680	610	1840	860	970	960
Mean cover of tree layer %		51	54	43	49	42	54	55	50	59	65	54	50	62	57	50	47	59
Mean cover of shrub layer (%)		14	18	29	31	28	25	19	20	2	3	3	5	15	25	2	7	3
Mean cover of herb layer (%)		28	54	47	62	63	67	73	53	64	55	53	51	58	43	46	29	41
Mean cover of moss layer (%)		8	5	7	10	23	60	18	3	25	62	3	1	29	43	5	3	5
Mean heigt of tree layer (m)		15	16	14	15	16	14	11	15	16	14	18	17	15	15	17	16	18
Mean heigh of shrub layer (cm)		62	64	36	41	40	38	38	36	37	40	44	44	40	41	32	34	30
Mean height of herb layer (cm)		32	36	34	32	28	22	23	35	36	36	38	38	33	29	26	24	27
Mean nr. of species in one relevé		44	59	49	52	51	41	43	43	62	60	48	41	64	45	57	49	43
Relevé area (m^2)		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	650
Number of species		81	110	102	205	123	85	80	84	105	101	158	138	160	80	130	90	91
Number of relevés		8	7	7	21	6	5	6	8	7	6	8	8	15	9	11	5	7
Main species of tree layer																		
Larix sibirica	-t1	V	IV^2	III	+	I	III	V^4	V^4	V^4	V^4	IV^4	V^3	V^4	V^4	.	.	.
Pinus sylvestris	-t1	V^4	III^3	V^3	V^4	V^4	V^4	.	.	.	.	.	.	.	.	V^4	V^4	V^4
D.S. Ass. ***Peucedano baicalensis-Pinetum sylvestris***																		
Calamagrostis pavlovii	-hl	V	.	.	.	.	.	I	II	.	.	.	.	.	.	.	.	.
Campanula rotundifolia	-hl	V	.	.	.	.	.	.	.	.	.	.	I	I	V	.	.	.
Gypsophila sericea	-hl	V	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vaccinium vitis-idaea	-hl	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Ass. ***Patrinio sibiricae-Pinetum sylvestris***																		
Potentilla sericea	-hl	.	V	.	.	.	.	.	.	.	.	.	I	+	.	.	.	.
Trommsdorfia maculata	-hl	II	V	II	II	.	.	.	.	.	.	IV	I	I	.	.	.	.
Eritrichium pectinatum	-hl	III	V	.	R	II	.	.	I	.	.	.	II	IV	.	+	.	.
Patrinia sibirica	-hl	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubus saxatilis	-hl	.	V^2	.	II	.	I	.	I	.	.	V^2	IV^2	II	.	.	.	.
Vicia unijuga	-hl	.	IV	.	III	I	.	.	.	.	.	V^2	IV	I	.	III	IV	IV
Pedicularis sibirica	-hl	.	IV	.	+	.	.	.	.	.	.	IV	II	IV	.	.	.	.
Lychnis sibirica	-hl	.	IV	.	.	.	.	.	.	.	.	.	.	I	.	.	.	.
Cerastium arvense	-hl	.	III	.	I	.	.	.	.	.	.	II	I	II	II	.	.	.
Artemisia santolinifolia	-hl	.	III	.	.	.	.	IV	.	.	.	.	.	.	III	.	.	.
Tephroseris porphyrantha	-hl	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Oxytropis campanulata	-hl	.	III	.	.	I	I	.	I	.	.	.	.	.	.	.	.	.
Antennaria dioica	-hl	II	III	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
D.S Ass. ***Carici pediformis–Laricetum sibiricae***																		
Spiraea trilobata	-s1	.	.	V^3	IV^2	V^2	V^2	.	.	V	I	.	.	.	.	.	.	.
Helictotrichon altaicum	-hl	.	.	V^2	II	V	II	.	IV	I	I	.	.	.	.	.	.	.
Galium paniculatum	-hl	.	.	I	II	V^2	V	.	.	V	V	.	.	.	.	.	.	.
Polygonatum odoratum	-hl	I	II	.	V	V^2	V	.	.	.	.	.	.	I	.	V	I	IV
Potentilla longifolia	-hl	.	.	III	I	III	II	.	.	.	.	II	I	+	.	.	.	.
Dracocephalum nutans	-hl	I	.	IV	III	I	.	.	.	.	.	.	.	.	.	.	.	.
Allium nutans	-hl	.	.	III	III	II	.	.	.	.	.	.	I	+	.	.	.	.
Inula salicina	-hl	.	.	.	III	IV	I	.	.	.	.	II	II	.	.	.	.	.
Centaurea sibirica	-hl	.	.	.	III	V	I	.	.	.	.	.	.	.	.	.	.	.
Hypericum elegans	-hl	.	I	.	III	III	.	.	.	.	.	.	.	+	.	.	.	.
Thymus serpyllum	-hl	.	I	III	I	IV	.	.	.	.	.	.	.	II	.	.	.	.
D.S. Subass. ***C.p.-P.s. juniperetosum sabinae***																		
Hedysarum gmelinii	-hl	.	.	V	+	II	II	.	.	.	I	I	II	+	I	.	.	.
Veronica porphyriana	-hl	.	.	V	.	.	.	.	.	.	.	.	.	.	III	.	.	.
Juniperus sabina	-s2	.	.	V^2	+	I	II	.	.	.	.	.	.	.	I	.	.	.
Spiraea hypericifolia	-s1	.	.	V	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Astragalus adsurgens	-hl	.	.	IV	.	.	.	.	.	.	II	I	.	+	III	IV	V	III
Artemisia dracunculus	-hl	.	.	IV	r	.	.	.	.	.	.	.	.	.	.	.	.	II
Stipa pennata	-hl	.	.	IV	I	.	.	.	I	.	.	.	I	.	.	.	.	.
Hieracium virosum	-hl	.	I	III	I	.	.	.	.	.	.	.	II	I	I	.	.	.
Erigeron krylovii	-hl	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stipa capillata	-hl	.	.	III	I	I	.	.	.	.	.	I	.	+	.	.	.	.
Potentilla bifurca	-hl	.	.	III	.	.	.	II	.	I	.	II	II	II	.	I	.	.
Linaria acutiloba	-hl	.	.	III	.	.	.	.	II	.	.	.	.	.	.	I	I	.

Table XII (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.S. Subass. ***C.p.-P.s. typicum***																		
Origanum vulgare	-hl	.	.	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.
Peucedanum morisonii	-hl	.	.	.	IV	I	I	.	.	.	.	.	.	.	.	.	.	.
Filipendula vulgaris	-hl	.	.	.	IV	.	I	.	.	.	.	.	.	.	.	.	.	.
Veronica spicata	-hl	.	.	I	III	.	.	.	.	.	.	.	.	.	.	.	.	.
Viola hirta	-hl	.	.	.	III	I	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***C.p.-P.s. youngietosum tenuifoliae***																		
Youngia tenuifolia	-hl	II	III	.	r	V	.	.	II	.	II	.	.	.	.	V	V	.
Dendranthema sinuatum	-hl	.	.	.	+	V	III	.	.	.	.	.	.	.	.	.	.	.
Potentilla acaulis	-hl	I	.	I	.	V²	III	.	.	.	.	.	.	.	.	III	.	I
Campanula altaica	-hl	.	.	.	+	III	.	.	.	.	.	.	.	.	.	.	.	.
Ziziphora clinopodioides	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.
Alyssum obovatum	-hl	.	I	.	r	III	.	.	.	.	.	.	.	.	II	.	.	.
Saussurea salicifolia	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.
Allium clathratum	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.
Echinops ruthenicus	-hl	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.
D.S. Subass. ***C.p.-P.s. neottianthetosum cucullatae***																		
Neottianthe cucullata	-hl	II	.	.	r	.	V	.	.	.	.	I	II	II	.	I	II	I
Seseli libanotis	-hl	.	.	.	I	I	IV	.	.	I	.	V	V	III	.	.	.	.
Potentilla flagellaris	-hl	.	.	.	I	.	III	.	.	.	.	IV	II	+	.	.	.	.
D.S. Ass. ***Colurio-Laricetum sibiricae***																		
Coluria geoides	-hl	.	.	III²	I	.	.	V²	IV²	.	.	.	II	I	V²	.	.	.
Spiraea media	-s1	II	III²	.	I	.	.	V	III	.	.	I	II	+	.	+	.	.
Dichodon cerastoides	-hl	.	.	.	.	.	.	V	.	.	.	.	.	.	.	.	.	.
Tephroseris praticola	-hl	.	.	.	.	.	.	III	.	.	.	.	.	.	III	.	.	.
Stellaria bungeana	-hl	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Picea obovata	-t2	II	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Goodyera repens	-hl	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Thesium repens	-hl	.	.	.	.	.	.	III	.	.	.	II	.	.	.	.	.	.
D.S. Ass. ***Anemono sylvestris-Laricetum sibiricae***																		
Caragana pygmaea	-s1	V²	.	.	II²	V²	III²	I	V²	II	.	.	.	.	.	II	.	.
Carex amgunensis	-hl	V²	.	.	.	.	.	.	V²	.	.	.	.	.	.	.	I	.
Dianthus superbus	-hl	.	.	.	+	.	.	III	V	.	.	I	II	.	.	.	.	.
Helictotrichon schellianum	-hl	I	V	.	.	.	.	.	IV	II	I	II	I	V²	V	.	.	.
Artemisia macrantha	-hl	.	.	I	I	.	.	II	IV	.	I	IV	.	.	III	.	.	.
Artemisia glauca	-hl	.	.	.	.	.	.	.	IV	.	.	.	.	+	.	.	.	.
Adenophora lamarckii	-hl	.	IV	.	.	.	.	.	IV	.	.	IV	IV	III	.	.	.	.
Lathyrus humilis	-hl	IV²	III	.	III	.	.	.	III	.	.	II	IV	+	.	II	.	IV
D.S. Ass. ***Primulo cortusoidis-Laricetum sibiricae***																		
Primula cortusoides	-hl	.	.	.	+	I	II	.	II	V	V	V	IV	IV	.	.	.	.
Saussurea controversa	-hl	.	V	.	.	.	.	.	I	V	V	V²	III	IV	.	.	.	.
Tephroseris integrifolia	-hl	II	V	.	II	II	I	.	II	V	V	V	III	IV	.	III	.	.
Geranium pseudosibiricum	-hl	.	V²	I	I	.	.	.	II	V²	V²	V	III	III	.	+	.	.
Elymus gmelinii	-hl	.	.	I	II	IV	I	.	.	V	V	IV	II	III	.	II	.	.
Viola dissecta	-hl	III	II	.	r	.	.	III	I	V	V	.	II	V	.	III	.	.
Agrimonia pilosa	-hl	.	.	.	II	II	I	.	I	V	.	III	I	III	.	+	.	II
Geranium pratense	-hl	.	.	.	II	I	I	.	.	V²	IV	III	.	II	I	.	.	.
Aulacospermum anomalum	-hl	.	I	I	I	II	II	.	.	V	V	IV	II	II	III	.	.	.
Artemisia latifolia	-hl	.	.	.	.	.	.	.	.	V	IV	IV²	I	.	.	.	.	.
Geum aleppicum	-hl	.	.	.	.	.	.	.	.	IV	I	IV	I	II	.	.	.	.
Plantago urvillei	-hl	.	.	.	.	.	.	.	.	III	I	IV	.	II	.	.	.	.
Elytrigia repens	-hl	.	.	.	.	.	.	.	.	.	III	V	IV	.	.	.	.	.
Adonis sibirica	-hl	.	.	.	.	.	.	.	.	IV	V	III	II	.	.	.	.	.
Artemisia laciniata	-hl	.	.	.	.	.	.	.	.	V	V	IV	.	.	.	.	.	.
Vicia cracca	-hl	.	.	.	II	II	.	.	I	I	IV	V	IV	+	.	.	.	III
Artemisia sericea	-hl	.	III	.	II	I	.	II	.	.	.	IV	V²	IV	.	.	I	IV
D.S. Subass. ***P.c.-L.s. elytrigietosum gmelinii***																		
Carex humilis	-hl	.	.	.	.	.	.	.	.	V	V²	.	.	.	.	.	.	.
Elytrigia gmelinii	-hl	.	.	.	.	.	.	.	.	V	V	.	.	.	.	.	.	.

Table XII (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Delphinium laxiflorum	-hl	.	.	.	I	II	.	.	.	V	V	.	.	.	.	.	.	.
Bistorta major	-hl	.	V	.	+	.	.	.	.	V	IV	.	.	.	.	.	.	.
Potentilla chrysantha	-hl	.	.	.	III	I	.	.	.	IV	IV	II	I	.	.	.	.	.
Adenophora liliifolia	-hl	.	.	.	r	.	.	.	.	IV	V	.	.	.	.	.	.	.
Carum buriaticum	-hl	.	.	.	+	.	.	.	.	III	IV	.	.	.	.	.	.	.
Valeriana alternifolia	-hl	II	.	III	II	.	.	I	.	III	III	.	.	II	.	+	.	.
Variant ***Adoxa moschatellina***																		
Adoxa moschatellina	-hl	.	.	.	.	.	.	.	.	V	I	.	.	.	.	.	.	.
Elymus sibiricus	-hl	.	.	.	.	.	.	.	.	IV	II	.	.	+	.	I	.	.
Arabis pendula	-hl	.	.	.	+	.	.	.	.	IV	I	.	.	+	.	.	.	.
Silene graminifolia	-hl	.	I	.	r	I	.	.	.	IV	I	.	.	.	.	.	.	.
Stellerópsis altaica	-hl	.	.	.	.	I	.	.	.	III	I	.	.	.	.	.	.	.
Gentianella amarella	-hl	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.
Variant ***Atragene sibirica***																		
Atragene sibirica	-hl	III	.	.	.	.	I	V	II	I	V	.	.	.	V	.	.	.
Malaxis monophyllos	-hl	.	I	.	+	.	.	.	II	II	V	.	I	I	.	.	.	.
Berberis sibirica	-s1	.	.	I	.	II	.	I	.	.	III	.	.	.	.	.	.	.
D.S. Subass. ***P.c.-L.s. filipenduletosum stepposae***																		
Filipendula stepposa	-hl	.	I	.	r	.	.	.	.	.	.	V	I	II	.	.	.	.
Veronica krylovii	-hl	.	I	I	II	II	II	.	.	I	I	V	.	I	II	.	.	.
Poa pratensis	-hl	.	.	.	.	.	.	.	.	.	.	IV[2]	II	.	.	.	.	.
Galatella macrosciadia	-hl	.	.	III	II	I	.	.	.	.	II	IV	I	II	.	.	.	.
Agróstis vinealis	-hl	.	.	.	.	.	.	.	.	.	.	IV	.	.	.	.	.	.
Ranunculus polyanthemos	-hl	.	.	.	.	.	.	.	.	.	.	IV	.	.	.	.	.	.
Onobrychis tanaitica	-hl	.	.	I	.	.	.	.	.	II	.	IV	II	.	II	.	.	.
Polygonatum humile	-hl	.	.	.	.	.	.	.	.	.	.	IV	.	+	.	.	.	.
Crepis praemorsa	-hl	.	III	.	.	.	.	.	.	.	.	IV	II	I	.	.	.	.
Myosotis imitata	-hl	.	.	I	+	.	.	.	.	.	.	IV	.	II	.	.	.	.
Hemerocallis minor	-hl	.	.	.	.	.	.	.	.	.	.	IV	II	I	.	II	IV	III
Helictotrichon pubescens	-hl	.	II	II	III	.	.	I	.	II	.	IV[2]	II	+	.	.	.	.
Tragopogon orientalis	-hl	.	I	.	+	I	.	.	.	.	.	IV	.	.	.	.	.	V
Adenophora coronopifolia	-hl	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.
Artemisia vulgaris	-hl	.	I	.	r	.	.	.	.	.	.	III	I	.	.	.	.	II
D.S. Subass. ***P.c.-L.s. betuletosum***																		
Poa transbaicalica	-hl	.	.	I	+	.	.	.	.	.	.	III[2]	V[2]	+	.	.	.	.
Betula pendula	-t1	II	V[4]	.	II	I	III	.	.	.	.	II[3]	IV[3]	I	.	.	.	.
D.S. Subass. ***P.c.-L.s. festucetosum sibiricae***																		
Festuca sibirica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	V	.	.	.	.
Potentilla nudicaulis	-hl	.	.	.	.	III	I	.	.	.	.	.	I	V	.	.	.	.
Oxytropis strobilacea	-hl	.	.	.	.	.	.	.	.	.	.	II	III	IV	.	II	II	.
Peucedanum vaginatum	-hl	.	.	.	.	.	.	.	.	.	.	I	I	III	.	.	.	.
Campanula sibirica	-hl	.	.	I	+	.	.	.	.	.	.	.	I	III	.	.	.	.
Galatella angustissima	-hl	.	.	I	.	.	.	.	.	.	.	II	I	III	II	.	.	.
Elytrigia geniculata	-hl	.	.	I	r	.	.	.	.	.	.	.	.	II	.	+	.	.
D.S. Ass. ***Cotoneastero uniflori-Laricetum sibiricae***																		
Cotoneaster uniflorus	-s2	.	.	III	.	.	.	I	.	.	.	.	.	.	V[3]	.	.	.
Oxytropis ambigua	-hl	.	.	.	.	I	.	.	.	.	.	.	.	.	V	.	.	.
Lonicera microphylla	-s1	.	.	II	.	.	.	.	.	.	.	.	.	.	V	.	.	.
Moehringia lateriflora	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	V	.	.	.
Gentiana decumbens	-hl	.	.	.	.	.	.	.	.	II	III	.	.	II	V	I	.	.
Rosa pimpinellifolia	-s1	.	.	.	I	.	.	.	.	.	.	.	.	.	V	.	.	.
Astragalus suffruticosus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	IV	.	.
Pedicularis achilleifolia	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	.	.
Potentilla conferta	-hl	.	.	.	.	.	.	.	.	II	.	.	.	.	IV	.	.	.
Gypsophila altissima	-hl	.	.	.	II	I	I	.	.	.	.	I	I	.	IV	.	.	III
Potentilla gelida	-hl	.	.	.	.	.	.	I	.	.	.	.	.	.	III	.	.	.
Astragalus multicaulis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	I	III	.	.	.
Pedicularis elata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.
Myosotis asiatica	-hl	.	.	.	.	.	.	I	.	.	.	.	.	.	III	.	.	.

Table XII (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.S. Ass. ***Lespedezo junceae-Pinetum sylvestris***																		
Leibnitzia anandria	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	V	.
Lespedeza juncea	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV^2	V	.
Carex argunensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V^2	V	.
Artemisia commutata	-hl	.	.	II	+	II	I	.	.	II	.	I	.	II	.	V	III^2	.
Artemisia frigida	-hl	.	.	I	.	II	.	.	.	.	.	.	.	I	.	IV	III	.
Viola gmeliniana	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	II	.
D.S. Subass. ***L.j.-P.s. typicum***																		
Lilium pumilum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	II	.
Saposhnikovia divaricata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	II	.
Polygala sibirica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	I	I
Allium tenuissimum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	II	.
Heteropappus altaicus	-hl	.	.	.	.	II	.	.	.	.	II	.	.	+	.	IV	II	.
Iris tigridia	-hl	.	.	.	.	I	.	.	.	.	.	.	.	.	.	IV	.	.
Ribes diacantha	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	.
Cleistogenes squarrosa	-hl	.	.	I	.	II	I	.	.	.	.	.	.	.	.	IV	I	.
Stipa baicalensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	I	I
Koeleria glauca	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	II	.
Vicia amoena	-hl	.	.	.	r	.	.	.	.	.	.	I	.	II	.	III	.	.
Chamaerhodos erecta	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	I	I
D.S. Subass. ***L.j.-P.s. silenetosum jenisseensis***																		
Silene jeniseensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	V	.
Saussurea elongata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	III
Astragalus membranaceus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	.
Aconogonon angustifolium	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	IV	.
Ixeridium chinense	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	IV	.
D.S. Ass. ***Pulsatillo turczaninovii-Pinetum sylvestris***																		
Carex lanceolata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V^2
Iris uniflora	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	V
Astragalus mongholicus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V
Bistorta alopecuroides	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V
Betula platyphylla	-t1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV^2
Lespedeza davurica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III
Festuca ovina	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III
Silene sibirica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III
Larix gmelinii	-t1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III^2
Spiraea flexuosa	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III^2
D.S. Suball. ***Sedo hybridi-Pinenion sylvestris***																		
Sedum hybridum	-hl	V	I	V	V	II	I	I	.	.	.	III	II	.	.	.	.	.
Orostachys spinosa	-hl	IV	IV	IV	III	V	.	.	.	I	.	.	.	II	.	.	.	.
Androsace septentrionalis	-hl	V	III	III	II	I	.	.	II	I	I	.	.	I	.	+	I	.
Hieracium umbellatum	-hl	V	V	.	IV	IV	III	.	.	.	.	V	IV	I	.	+	.	II
Woodsia ilvensis	-hl	IV	.	II	III	I	.	.	.	.	.	.	.	.	.	.	I	.
Rhododendron dauricum	-s1	IV	II	.	I	II	IV	I	II	.	V	.	.	.	.	.	II^2	I
Euphorbia alpina	-hl	.	V	.	II	III	II	.	.	.	.	.	.	.	.	.	.	.
Dracocephalu ruyschiana	-hl	III	III	I	III	I	.	.	.	.	.	II	.	I	.	.	.	.
Aconitum anthoroideum	-hl	.	III	III	II	I	.	.	.	.	I	II	.	.	.	.	.	.
D.S. All. ***Cotoneastero melanocarpi-Laricion sibiricae***																		
Iris ruthenica	-hl	V^2	V^2	IV^2	V^2	III^2	V^2	.	V^2	V	V^2	V^2	V^2	V^2	I	.	.	.
Poa urssulensis	-hl	V	II	V	V	V	IV	V	IV	V	V	II^2	I	IV	V^2	.	.	.
Festuca pseudovina	-hl	V	V^2	V	r	.	.	V	I	V^2	V^2	IV	II	V	V	.	.	.
Phleum phleoides	-hl	IV	III	V	IV	.	.	IV	V	I	.	V	III	II	II	.	.	.
Allium strictum	-hl	IV	.	V	II	.	I	.	III	.	II	IV	III	II	II	.	.	.
Caragana arborescens	-s1	.	III^2	.	II^2	IV^2	III	V^2	III	.	IV	.	.	.	II^2	.	.	.
Fragaria viridis	-hl	I	III	IV	V	II^2	I	.	I	III	.	IV^2	.	IV	.	.	.	.
Carex obtusata	-hl	IV	IV	V	r	.	.	V^2	.	IV	III	.	.	III	V^2	+	.	.
Anemone sylvestris	-hl	.	.	.	I	.	.	V^2	V	IV	V	V	II	III	II	.	.	.
Spiraea chamaedryfolia	-s1	IV	I	I	I	.	II	V	V^2	.	II	I	I	I^2	IV	.	.	.
Polygala comosa	-hl	I	III	III	I	IV	.	II	I	I	.	III	II	I	V	.	.	.
Thalictrum petaloideum	-hl	.	IV	.	I	.	III	.	.	III	.	IV	.	IV	.	.	.	.

Table XII (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.S. All. ***Pulsatillo turczaninovi-Pinion sylvestris***																		
Stemmacantha uniflora	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	IV	V
Patrinia rupestris	-hl	.	.	III	.	.	.	.	.	.	.	.	.	+	.	V^2	V	V
Pulsatilla turczaninovii	-hl	.	.	.	.	.	.	.	I	.	.	.	.	I	.	V	IV	V
Dendranthema zawadskii	-hl	.	.	.	.	.	.	.	.	.	.	.	IV	V	.	V	V^2	V
Scabiosa comosa	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	III	V
Bupleurum scorzonerifolium	-hl	.	.	.	+	II	I	.	.	I	.	II	II	III	.	V	V	IV
Filifolium sibiricum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	III	IV
Potentilla tanacetifolia	-hl	.	.	.	I	II	.	.	.	I	.	.	II	.	.	V	III^2	III
Sedum aizoon	-hl	.	.	.	II	.	.	.	.	.	.	.	.	I	.	II	IV	III
Stellera chamaejasme	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	V^2	V
Allium splendens	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	.	III	I	III
Orostachys malachophylla	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	IV	I
Oxytropis myriophylla	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	IV	IV
Leontopodium conglobatum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	II	III
D.S. Ord. ***Carici pediformis-Laricetalia sibiricae***																		
Cotoneaster melanocarpus	-s1	V	V^2	V	V^2	IV^2	III^2	V	V^2	V	IV	I	V^2	V^2	V^2	IV	.	.
Veronica incana	-hl	V	V	.	II	I	IV	III	III	II	.	I	IV	IV	.	V	.	III
Kitagawia baicalensis	-hl	V	V	V	III	V	III	III	I	II	I	.	I	IV	III	V	IV	.
Schizonepeta multifida	-hl	.	III	.	II	V	IV	V	III	V	V	V^2	III	V	I	V	I	IV
Phlomoides tuberosa	-hl	.	I	V	V	V	IV	V	III	IV	IV	V^2	III	V	III	II	.	I
Dianthus versicolor	-hl	II	III	V	IV	.	I	.	.	III	.	II	II	IV	I	II	IV	I
Artemisia gmelinii	-hl	.	.	V^2	IV	V	IV	I	.	.	.	I	II	III^2	.	IV	IV	.
Vicia nervata	-hl	V	V	.	IV	III	IV	II	V	III	V	.	II	V	.	+	III	II
Koeleria cristata	-hl	.	V^2	III	I	I	I	.	I	V	V	.	.	I	.	IV	IV	III
Achnatherum sibiricum	-hl	.	.	II	II	III	III	I	.	II	I	II	IV^2	III	.	IV	I	IV
D.S. Ord. ***Festuco ovinae-Laricetalia sibiricae***																		
Bromopsis pumpelliana	-hl	II	.	V	.	.	.	V	II	.	.	II	II	III	.	II	II	I
Bistorta vivipara	-hl	.	.	.	r	.	.	.	.	.	.	I	I	.	.	.	.	.
Trisetum sibiricum	-hl	.	.	.	r	.	.	.	.	.	.	I	I	+	.	.	.	.
D.S. Cl. ***Rhytidio rugosi-Laricetea sibiricae***																		
Carex pediformis	-hl	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V^2	V
Pulsatilla patens	-hl	V	V^2	V	IV	V	V	IV	V^2	IV	V	IV	V^2	V	V^2	V	V^2	IV
Galium verum	-hl	III	V	V	V	V	III	V	V	III	III	V	V	V	V^2	III	.	II
Rhytidium rugosum	-ml	V^2	V^2	V^2	II^2	II^2	V^3	V^2	IV	IV^2	V^3	.	.	V^3	V^3	IV^2	I	V
Aster alpinus	-hl	IV	V	I	r	.	.	V	IV	V	IV	V	V	V	III	V	V	V
Thalictrum foetidum	-hl	IV	.	.	II	IV^2	IV	V^2	V^2	V	V^2	V^2	IV	V^2	V^2	IV	I	.
Scorzonera radiata	-hl	III	V	.	r	I	.	III	IV	.	III	III	II	IV	II	III	IV	.
Aconitum barbatum	-hl	IV	V	.	III^2	III^2	V^2	V^2	IV	V^2	V^2	V	IV	V	V	.	.	.
Bupleurum multinerve	-hl	V^2	V	III	IV	V^2	V	.	V	IV	IV	IV	IV	V	V^2	.	.	.
Poa sibirica	-hl	III	III^2	.	.	.	.	V^2	IV	III	V	II	II^2	III	III	.	.	I
Abietinella abietina	-ml	.	II	III^2	.	.	.	III	.	V^3	V^3	.	.	IV^2	II	.	.	.
Potentilla matsuokana incl. *P. nivea*	-hl	III	.	I	.	.	.	II	.	V	.	.	.	III	III	IV	I	.
D.S. Cl. ***Brachypodio pinnati-Betuletea pendulae***																		
Calamagrostis arundinacea	-hl	.	III	.	IV	.	.	.	.	.	.	.	I	.	.	.	.	.
Brachypodium pinnatum	-hl	.	.	.	II	.	.	.	.	.	.	I	II	.	.	.	.	.
Serratula coronata	-hl	.	.	.	II	.	I	.	.	.	.	.	.	.	.	.	.	.
Lilium pilosiusculum	-hl	I	.	.	r	.	.	IV	I	.	.	II	.	+	V	.	.	.
Carex macroura	-hl	II	.	.	II	I	II	.	I	.	.	II	.	.	.	.	.	.
Cimicifuga foetida	-hl	.	I	.	r	.	.	.	.	I	I	II	I	.	.	.	.	.
Heracleum dissectum	-hl	.	.	.	r	.	.	.	.	.	.	I	.	.	.	.	.	.
Pulmonaria mollis	-hl	.	I	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.
Other species:																		
Lupinaster pentaphyllus	-hl	V	V	III	V	I	III	I	I	V	V	V	II	I	.	V	IV	V
Campanula glomerata	-hl	II	IV	.	II	I	.	III	III	V	V	V	V	III	III	.	.	II
Galium boreale	-hl	V	V	.	II	.	II	IV	V	IV	V	V	IV	IV	.	.	.	.
Artemisia tanacetifolia	-hl	IV	IV	.	.	.	.	V	V^2	.	.	IV^2	V^2	V^2	V^2	+	V	V^2
Achillea asiatica	-hl	V	V	.	V	II	II	.	III	V	IV	V	II	III	.	.	.	.
Thalictrum minus	-hl	.	IV	.	III	II	V	.	I	III	.	V	IV^2	III	.	.	.	III

Table XII (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Sanguisorba officinalis	-hl	.	V	.	II	I	III	.	.	V	V	V	IV	V	.	III	III	V
Rosa acicularis	-s1	IV	V	I	II	.	.	V	V	.	I	II	III	III	I	II	.	.
Ephorbia discolor	-hl	II	.	.	II	II	II	.	II	V	V	.	II	.	.	.	.	.
Veratrum nigrum	-hl	II	I	.	r	.	IV	V	IV	II	I	IV	IV	V	.	.	.	.
Viola arenaria	-hl	II	IV	.	I	II	I	.	V	.	III	.	.	II	V	.	.	.
Pleurozium schreberi	-ml	II	I	.	r	.	.	III	IV	V	V[2]	.	.	III	II	.	.	.
Pinus sylvestris	-s1	V	IV	IV	IV	III	IV	.	.	.	.	.	.	.	.	V	IV	V
Larix sibirica	-s1	.	III	II	.	.	II	II	III	III	I	II	.	III	.	.	.	.
Poa botryoides	-hl	.	.	V	r	.	.	.	.	.	.	.	.	IV	V[2]	V	V	III
Chamaenerion angustifolium	-hl	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I	IV	IV
Aconogonon alpinum	-hl	II	III	III	II	I	.	III	.	I	.	.	.	+	I	.	I	I
Hieracium echioides	-hl	.	III	III	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Noccaea cochleariformis	-hl	.	III	.	.	.	.	.	.	.	.	I	.	II	.	.	.	.
Carex korshinskyi	-hl	.	.	V	I	III	.	.	.	.	.	III[2]	.	.	.	.	III	IV
Allium rubens	-hl	.	.	III	I	II	.	.	.	.	.	.	I	+	II	.	.	.
Silene nutans	-hl	.	I	III	II	I	.	.	.	.	I	.	.	.	.	.	.	.
Astragalus ceratoides	-hl	.	.	III	r	II	I	.	.	.	.	.	.	.	.	.	.	.
Silene repens	-hl	.	.	I	I	.	.	V	IV	.	.	II	.	.	.	+	.	.
Mnium species	-ml	.	.	.	.	.	.	V	.	.	.	.	.	.	.	.	.	.
Elymus komarovii	-hl	.	.	.	.	.	.	IV[2]	III	IV	V	.	.	+	.	.	.	.
Elymus mutabilis	-hl	.	.	.	.	.	.	.	V	I	IV	.	.	.	.	I	.	.
Elymus transbaicalensis	-hl	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.
Primula macrocalyx	-hl	.	I	.	II	.	.	.	.	III	I	III[2]	I	I	.	.	.	.
Leontopodium leontopodioides	-hl	.	.	.	r	I	I	.	I	III	II	.	.	I	.	.	.	.
Scutellaria scordiifolia	-hl	.	.	.	II	II	.	.	.	.	.	IV	I	III	.	I	I	.
Helictotrichon desertorum	-hl	.	.	.	.	.	.	.	.	.	.	III[2]	IV[2]	.	.	.	.	.
Scabiosa ochroleuca	-hl	.	.	I	I	I	.	.	.	.	I	II	II	III	I	.	.	.
Adenophora stenanthina	-hl	.	.	.	.	.	.	.	.	.	.	.	II	III	.	.	.	.
Dicranum polysetum	-ml	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.
Calamagrostis epigeios	-hl	.	II	.	II	.	.	.	.	.	.	I	II	.	.	III	.	IV
Carex caryophyllea	-hl	II	.	II	r	.	.	.	II	.	.	.	.	.	.	.	.	.
Aquilegia sibirica	-hl	.	II	.	.	.	.	I	.	.	I	.	II	.	.	.	.	.
Gentiana macrophylla	-hl	I	II	.	I	.	I	.	.	.	.	II	II	.	.	.	.	.
Minuartia verna	-hl	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ptarmica impatiens	-hl	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene multiflora	-hl	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pinus sibirica	-s1	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cirsium serratuloides	-hl	.	.	.	II	.	I	.	.	.	.	.	.	.	.	.	.	.
Goniolimon speciosum	-hl	.	.	.	r	II	.	.	.	.	.	.	.	I	.	.	.	.
Hieracium pilosella	-hl	.	.	I	.	II	I	.	.	.	.	.	.	.	.	.	.	.
Thesium refractum	-hl	.	.	.	+	II	I	.	.	.	.	.	II	I	.	.	.	.
Pentaphylloides fruticosa	-s1	.	.	.	.	II	.	.	.	.	.	.	.	I	.	+	.	II
Onobrychis sibirica	-hl	.	.	.	+	II	II	.	.	.	.	.	.	.	.	.	.	.
Euphrasia parviflora	-hl	.	.	.	r	II	.	.	.	I	.	II	.	.	.	.	.	.
Anagallidium dichotomum	-hl	.	.	.	.	II	I	.	.	.	.	.	.	.	.	.	.	.
Linaria vulgaris	-hl	.	.	.	I	II	.	.	.	.	.	II	.	I	.	.	.	.
Asparagus officinalis	-hl	.	.	.	r	II	.	.	.	.	.	.	.	.	.	.	.	.
Stevenia cheiranthoides	-hl	.	.	.	.	II	.	.	.	.	.	.	.	II	II	.	.	.
Hylocomium splendens	-ml	.	.	.	.	.	.	II	I	.	.	.	.	.	.	.	.	.
Serratula marginata	-hl	.	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.
Ptilium crista-castrensis	-ml	.	.	.	.	.	.	I	II	.	.	.	.	.	.	+	.	.
Erysimum flavum	-hl	.	.	.	.	.	.	.	II	.	.	.	.	+	.	+	.	.
Rhodobryum roseum	-ml	.	.	.	.	.	.	I	.	II	II	.	.	II	.	.	.	.
Allium vodopjanovae	-hl	.	.	.	.	.	.	.	.	II	II	.	.	.	.	.	.	.
Ligularia glauca	-hl	.	I	.	.	.	.	.	.	II	II	.	.	.	.	.	.	.
Bromopsis inermis	-hl	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.
Astragalus danicus	-hl	.	.	.	.	.	.	.	.	I	.	II	.	.	.	.	.	.
Lathyrus pratensis	-hl	.	.	.	.	.	.	.	.	.	.	II	I	.	.	.	.	.
Viola rupestris	-hl	.	.	.	.	.	.	.	.	.	.	II	II	.	.	.	.	.
Lathyrus pisiformis	-hl	.	I	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Hypericum attenuatum	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	+	.	.
Solidago virgaurea	-hl	.	.	.	I	.	.	.	.	.	.	II	.	.	.	.	.	.
Plantago media	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Viola canina	-hl	.	.	.	.	.	.	.	.	.	.	II	I	.	.	.	.	.
Trifolium pratense	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.

Table XII (continuation)

Column nr.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Stellaria graminea	-hl	.	.	.	.	.	.	.	.	.	.	II	I	I	.	.	.	.
Rumex thyrsiflorus	-hl	.	.	.	.	.	.	.	.	.	.	II	.	I	.	.	.	.
Achnatherum confusum	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Pedicularis incarnata	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Potentilla humifusa	-hl	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.
Populus tremula	-t2	.	I	.	r	.	.	.	.	.	.	.	II	.	.	.	.	.
Elymus caninus	-hl	.	.	.	.	.	.	.	.	.	.	I	II	.	.	.	.	.
Lathyrus frolovii	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Onosma simplicissima	-hl	.	.	.	I	.	.	.	.	.	.	.	II	I	.	.	.	.
Vicia megalotropis	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Thermopsis lanceolata	-hl	.	.	.	.	.	.	.	.	.	.	.	II	II	.	II	.	.
Zigadenus sibiricus	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Paeonia anomala	-hl	.	.	.	.	.	.	.	.	.	I	I	II	.	.	.	.	.
Erigeron acris	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Gymnadenia conopsea	-hl	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.
Hedysarum minussinense	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.
Phlox sibirica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.
Astragalus austrosibiricus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.	.
Lonicera pallasii	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.
Carum carvi	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.
Draba sibirica	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.
Elymus sajanensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.
Helictotrichon hookeri	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	I	.
Medicago falcata	-hl	.	.	I	I	.	.	.	.	.	.	I	.	.	.	II	I	.
Ixeridium graminifolium	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Agropyron cristatum	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	I	II	.	.
Spiraea aquilegifolia	-s1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Astragalus melilotoides	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	I
Dontostemon micranthus	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Centaurea scabiosa	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Saxifraga bronchialis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Veronica linariifolia	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Thymus baicalensis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	II	.
Heteropappus biennis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Pedicularis striata	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Iris humilis	-hl	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	II	.
Fragaria orientalis	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Artemisia rupestris	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Pyrola incarnata	-hl	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Clematis hexapetala	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Medicago trautvetteri	-hl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Polytrichum juniperinum	-ml	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	II

Table XII (continuation)

Species with few occurences:

Aconitum volubile (hl) - 11(I), *Adenophora tricuspidata* (hl) - 11(I), 13(I), *Adonis vernalis* (hl) - 11(I), *Allium senescens* (hl) - 15(I), 16(I), *A. stellerianum* (hl) - 12(I), *Amoria repens* (hl) - 11(I), *Androsace filiformis* (hl) - 17(I), *A. incana* (hl) - 15(I), *A. koso-poljanski* (hl) - 3(I), *Anemonastrum crinitum* (hl) - 2(I), 4(+), *Armeniaca sibirica* (s1) - 17(I), *Artemisia leucophylla* (hl) - 15(+), *Asplenium septentrionale* (hl) - 4(+), 5(I), *Asterothamnus fruticosus* (hl) - 15(+), *Astragalus propinquus* (hl) - 11(I), *Aulacomnium turgidum* (ml) - 7(I), *Bergenia crassifolia* (hl) - 4(+), *Berteroa incana* (hl) - 13(+), 17(I), *Calamagrostis korotkyi* (hl) - 16(I), *Camelina sativa* (hl) - 11(I), *Campanula cervicaria* (hl) - 4(+), *C. turczaninovii* (hl) - 7(I), *Caragana buriatica* (s1) - 15(+), *Carduus crispus* (hl) - 11(I), *Carex duriuscula* (hl) - 13(+), *C. ericetorum* (hl) - 15(+), *C. praecox* (hl) - 11(I), *Centaurea marschalliana* (hl) - 9(I), *Chelidonium majus* (hl) - 4(+), *Crepis bungei* (hl) - 15(I), *C. flexuosa* (hl) - 17(I), *C. sibirica* (hl) - 2(I), 4(+), *C. tectorum* (hl) - 17(I), *Cruciata krylovii* (hl) - 4(+), *Cypripedium guttatum* (hl) - 12(I), *C. macranthon* (hl) - 11(I), 12(I), 17(I), *Cystopteris fragilis* (hl) - 4(+), *Dactylis glomerata* (hl) - 4(I), *Delphinium grandiflorum* (hl) - 15(+), 16(I), *Draba cana* (hl) 1(I), - 8(I), *D. nemorosa* (hl) - 7(I), 13(+), *Dracocephalum peregrinum* (hl) - 5(I), *Elymus confusus* (hl) - 15(+), *E. dahuricus* (hl) - 5(I), 6(I), 17(I), *Equisetum hyemale* (hl) - 5(I), *Eremogone capillaris* (hl) - 16(I), *Erysimum hieracifolium* (hl) - 14(I), *Euphorbia microcarpa* (hl) - 4(+), *E. subcordata* (hl) - 11(I), *Fallopia convolvulus* (hl) - 4(+), *Festuca lenensis* (hl) - 15(I), *F. rubra* (hl) - 3(I), 10(I), *Fragaria vesca* (hl) - 4(+), *Galatella dahurica* (hl) - 15(I), 16(I), *G. hauptii* (hl) - 3(I), 4(I), *Gentiana squarrosa* (hl) - 9(I), *Gentianopsis barbata* (hl) - 9(I), 11(I), *Geranium sylvaticum* (hl) - 12(I), *G. transbaicalicum* (hl) - 17(I), *Grossularia acicularis* (s1) - 3(I), 9(I), 10(I), 11(I), 13(+), *Gypsophila davurica* (hl) - 16(I), *Hedysarum neglectum* (hl) - 12(I), *Hierochloe odorata* (hl) - 11(I), *Hylotelephium populifolium* (hl) - 1(I), 8(I), *H. triphyllum* (hl) - 4(+), 5(I), *Juniperus sibirica* (s1) - 3(I), 14(I), *Kadenia dubia* (hl) - 11(I), 12(I), *Lamium album* (hl) - 13(+), *Lappula squarrosa* (hl) - 1(I), 3(I), 4(+), 10(I), 11(I), *Lathyrus vernus* (hl) - 11(I), *Leontopodium ochroleucum* (hl) - 11(I), *Leymus chinensis* (hl) - 17(I), *Linum perenne* (hl) - 15(I), *Lithospermum officinale* (hl) - 4(+), *Lonicera altaica* (s1) - 1(I), *L. tatarica* (s1) - 4(+), *Luzula pilosa* (hl) - 2(I), *Melandrium album* (hl) - 4(+), 11(I), *Melica nutans* (hl) - 4(+), *M. transsilvanica* (hl) - 4(+), *Myosotis arvensis* (hl) - 9(I), *Oberna behen* (hl) - 1(I), *Orthilia secunda* (hl) - 2(I), 12(I), 13(+), 15(+), *Oxytropis argentata* (hl) - 6(I), *O. caespitosa* (hl) - 16(I), *O. deflexa* (hl) - 7(I), *O. lanata* (hl) - 15(I), *Padus avium* (s1) - 4(+), *Paeonia hybrida* (hl) - 4(+), *Papaver rubro-aurantiacum* (hl) - 15(+), *Parnassia palustris* (hl) - 10(I), *Pedicularis rubens* (hl) - 16(I), *Phlojodicarpus sibiricus* (hl) - 13(+), 15(+), *Platanthera bifolia* (hl) - 4(I), *Poa attenuata* (hl) - 11(I), *Polemonium coeruleum* (hl) - 9(I), *Polypodium vulgare* (hl) - 1(I), 4(+), *Potentilla fragarioides* (hl) - 4(I), *P. verticillaris* (hl) - 15(I), *Pteridium aquilinum* (hl) - 4(+), *Pulsatilla ambigua* (hl) - 16(I), *Pyrola rotundifolia* (hl) - 12(I), *Rhytidiadelphus triquetrus* (ml) - 8(I), 13(+), *Rosa davurica* (s1) - 17(I), *Rubus idaeus* (s1) - 4(+), *Salix pyrolifolia* (s1) - 15(+), *Saxifraga sibirica* (hl) - 2(I), *Scutellaria galericula* (hl) - 17(I), *Silene viscosa* (hl) - 4(+), *Sisymbrium heteromallum* (hl) - 1(I), *Sorbus sibirica* (s1) - 4(+), *Spiraea crenata* (s1) - 4(+), *S. sericea* (s1) - 15(I), *Taraxacum officinale* (hl) - 11(I), 12(I), *Verbascum phoenicium* (hl) - 4(+), 5(I), 6(I), *V. thapsus* (hl) - 4(+), *Viola disjuncta* (hl) - 6(I), *Viola macroceras* (hl) - 4(+), 5(I), *V. montana* (hl) - 4(+).

Table XIII — Nomenclatural types of new associations and subassociations

Relevé nr.	1111111111222222222233333333334444444444555555555566666666667777777777888888888899 12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Galium boreale	+11111+11+21++1.+..+++1+++.+.111+++++11..11++++11.....+..1+....++....r....++1+.+..++11+++1+
Rubus saxatilis	2221221222221121+..2112+12.1+21112+112221222222.............2...2...r2.....2111....+2+1+1+2
Lupinaster pentaphyllus	.11+1++1.++++++....+1+1+.+.....+...+..1..1+++.1.1++++++r.....++1++.rr.++1+++++.+.+++.++r.+
Sanguisorba officinalis	+1.+++.+1.111+..+....+++.......++..+++1+...1+.+.........1..++.+.++.+rr.+++111+1+++++++++r++
Betula pendula	.3+.3+143144343+++.412..2+.+114231321244314+3234.............3.+.4...14.............4+2.1.4
Thalictrum minus	1.1.11+1111+1+1+.+.1++12+1++1111.1+1111+.1++..+.1.....1+r....+.+...1.............+...r.+
Brachypodium pinnatum	222+121+..222.2.1..1122121.++1111.+222.2.11212+.............2........2.............2121+22
Lilium pilosiusculum	++1.+++++++++.+.+.11+.+++1.+.+1.+.+1+1...,+++1.111...+1+....+.........+.............+.+.rrr
Pinus sylvestris	.33.344.......334..1322334.23..23..+42...4324.....................244+.3....444..+.+.233..3333+.
Iris ruthenica	1222111112111.212..21211.2...2+1+..+1222.22.2...2.............2222.122.....
Lathyrus humilis	1+11.++1+1.+++1+2..11.12....+.+..1..+1.....+..........2.1.+.......r...+1112+21121+.....
Pulmonaria mollis	+1.++1+1+.+1++1....++.+1+.+.1++1+.+.11.+.11+111.............1.....1+++.++
Poa sibirica	11++..+111....+.....+1.+...1.+.1.............1221121122+21...+...+r1+...1+.11+..+1.....
Calamagrostis arundinacea	.22.2212..12+..22..2212.+1.+1.111..122..1.1212.............2...1.................2221112
Hieracium umbellatum	.++.11+++.+.+.+r1...+.+.........+...+...+1..++1.............+..+...rr....++++++.+++++..+++
Pleurospermum uralense	+11++++1+1++...r+..++.+.+++..+11++++.1.1..+..+.............1.....1++1.....+....+
Geranium pseudosibiricum	1...1111+1....+++..21.1.....1..1..+.........2.2...1...+121...12..11.....+..+111...+++
Crepis sibirica	11+111.1.++.1.+..11...+.++1..121+++212.....+2.....+.....2.+.+.....+...rr
Vicia unijuga	.1.+11+11.11+.....++1.....+..1..1..+.1.....+.....1...1r.+111+1.+11111.....
Pulsatilla patens	.....+..+.+...+++..2+.....+..r....+.+1....+111++1112+1..1+..+1111..+.1..
Larix sibirica	4+.4...134.....+.....4+.+4..1.....3443444334444...+.4.44.4.....+..13.
Maianthemum bifolium	.1+.+..++.....11+.++.++++.1+.1+11.++2....1+++.....11+.....+++...
Phlomoides tuberosa	++.111++.r++++1....1++.1.....+.....+.++...+.....+.....11..+++1.++.....++
Polygonatum odoratum	.+1.11+...+++++....+.2.+++.....+....+11+1+.....121.+.....+.+.....+..+...++r
Campanula glomerata	++.+1+.++.+.+...+...+.....+..+.....1+...++.+...+...1+..rr....+.+++....+++..r.+
Artemisia tanacetifolia	.....+.+1+.....+..+.....1.121...r1+1...+...1211+111221+22212.....
Carex macroura	22222222.1.1+12...2212222.21.12111122.....2.....
Carex pediformis	.....2+.....1.2.....2121+.2222.2..222222212212+..++..2.+.....
Galium verum	...+.+r...+.+++...+.....+.++.....+1.1+1..++.1.1+1+11r1+.....r.....+.....
Heracleum dissectum	1+.+1+.++++...+..+1+++1+.1..+11.+++11.....+.....+...+.....
Populus tremula	.+...+.+...+3.+..+3....++.4.+.+1..43+3+..+...+.....3.....114++.+..+.....
Aconitum barbatum	++..+1.12..+.+.....1.2.....211211...+r+..12.+1..1r+.....+++.....
Rosa acicularis	...1.....++2..2+...11.1+.....+..+..+1.....+.....++.+....1...r.....+.+2..+1.+.++..
Rhytidium rugosum	.....1.....323333332+31+..311113..32.r.1...+1.++.....
Pleurozium schreberi	+...+1+11+....1.....+...+...1+1.+..1+...12+1....1....1.....+.+.....+2+.+..
Angelica sylvestris	.+++11.1..+.+...++..+..++1...+12..+111.+....++1.....+.....+.....
Atragene sibirica	.++...111.....+.+...+.....+..+.....11111+111+.++.....+.....+.++....
Vicia cracca	.....+..+..++.....+...+.....+...+++1++..1..1.....1r+..+.....2r.....1...+...+..+r
Spiraea chamaedryfolia	2.+.1+1+22.....2...1..31.+.+.1+.....111...111.....+1.....r1.....
Agrimonia pilosa	+..111.1..1+1+.....+.+.+...+..1++.++.....+.+.+.....+.....+.....++.....
Dactylis glomerata	.++211....1.+.1.....++.11+.11.+1...1..+.+.....1++.1+
Vicia sepium	..+.1..+..1.....++.++++11.+1+..+.+.++1+.....+.....+++...
Viola uniflora	+11...111+...+.+1.1...+..11+11++11+.+2.....+.....
Solidago virgaurea	+..+...+..++..1..+.+.+...+.+..++.....1..11+...1.....r.....+1++++
Bromopsis pumpelliana	.....1.1.....2.....1.....2111+11..1+2.....+.r..+1..11.2..111.....
Cotoneaster melanocarpus	+..1..1.1..+..1.....1.....+...+.....+2212++1.12+.....+..1..+..r
Trisetum sibiricum	.1+....++1+.....++.....+..++...+.....++1111..1.11.....++....+.....
Trollius asiaticus	111....11.+....++...1.11...+.11++112+1.....+..+.....+.....
Cimicifuga foetida	++1.1++11+.+...1...12+..++.+++1.++..+.....
Aster alpinus	.....+.....+,11+1++.....+11+111.++r.....1r+r....r..
Thalictrum foetidum	.....111.....1.....1..11..+21+.r.+.111.+.2r121.....+.....
Fragaria vesca	....1.11..11+.....+1.+1.++.....2.211.+.....2.....2.11r+.
Cacalia hastata	....+.....+1...1.++11++++1++++.....11.....11.+.....
Pteridium aquilinum	.2..222...1+.....1.2.2.11.21..21..122.....13.....2.....+.....
Equisetum pratense	....+.....+....1.....11+..+++1.+1...1....1+.1.....r.....+1.1+1.....
Lathyrus gmelinii	.+1...++..+.....11.....1++211212.2+1.....++.....++....
Origanum vulgare	...++++...+.++1.....+1+++++.....+.....1.+.+1+
Rosa majalis	....11+1..++...+.....+...+.+11+1+++.....+.....+....++
Lathyrus pisiformis	...+1+1+.1...+.....+.....+r11+++.....+.....r.....+.+r+
Serratula coronata	++..11.+..+.1.+....+.+.....1+..+..1++..+.1.....+.....1....rr
Achillea asiatica	+..+.+.+++.....+..+r+.+.....+.....r+..+.+++..2.....+...+.....
Fragaria viridis	...+.1.+..1..21....1.2.....11.+1.....1..+++12.....+++
Moehringia lateriflora	.....+..+.....1..+++++.+.+1...+.....+...++.++....+.++....

Table XIII (continuation)

Relevé nr.	111111111122222222223333333333444444444455555555556666666666777777777788888888899 12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Poa urssulensis	...1.....+.....1....+.+.....1r.+.1.....111++..2...++++.+.....
Caragana arborescens	.....+1...+3..2..+...1..311.....1.....33....3.1....2.....1+.2.....2.....
Calamagrostis epigeios	...+.....2.....+.....2211.1.11.....r.+.+....11+11+....+..
Filipendula vulgaris	.....+...1+++.....+.....11++1+11.....+.....1.+.+++
Seseli libanotis	...+...+..1.+.+.....+.....112..+.1.....1.+.....11.....2.+.+r+
Bupleurum multinerve	.....+.....+.....1+1111111.....1+2++.+rr1.....
Spiraea media	....1111...1.....1...+.....+.....+.+....1.....+..+++1+2..11.....
Dracocephalum ruyschiana	.....+...1+..+....+..r.....++.+.+.....++.....+...+.+.+.+++
Lathyrus vernus	.....+.+.....+.1.....+1+..1..1211.....2.....++++r+
Aconitum septentrionale	.....22.....1122212222+21.....++1..r
Festuca ovina	.....1.....+.....1+1.2+111+.1.....++++..+..1+.....
Viola hirta	...+++++..++++....+.....+.....+.....+.....+.....++++...
Dianthus superbus	.++.+..+...+..+++.....+.....111+1+1+..+.....
Chamaenerion angustifolium	..+....+.....+...r..+.....1..++.++.....+....+.1.++.....++....+.....
Bupleurum aureum	1+2+1+.....+.2...1.....+.1+.+.....+....+.....+1..+.
Erythronium sibiricum	.+11++++++.....111111+++..+.....
Cerastium pauciflorum	.1+1.....+.....+1.11.+211.....+...r+.....+11...
Dendranthema zawadskii	.....+..+.....12.+.....+.r.+1++++..++111.....
Scorzonera radiata	.....+..+.....1.....1....+.+.....+..+rr..1..++..++11+.....
Valeriana alternifolia	...+....+.....++.....+..+.....+.....1r+....+..++.....++++.+.....
Carex amgunensis	.....11.....1.....1.22.....r.2...1.....221.12+111.....
Cruciata krylovii	11111+1..+.....1.....11.+11.121.....
Inula salicina	....11++..+++.....+.....+...+...++11.....1.....r.....+.
Aconitum volubile	.+.+1+.+..+..++.....1.++++++.++.....
Saussurea controversa	1.....11+.1...+....1.....11+2..1.....+..++..2r.....
Viola mirabilis	....+.+1..++1.....1.....+..1.....+.....1.....++++.++
Melica nutans	....+.....+1.++++.+...++....+....+.....11+.++
Lathyrus pratensis	.....+...+..++.+.....+....+..++.1+.....+.....r.....+...r+.
Padus avium	....1..+..+.....+.....r.112.+1+.+..+.....+.+.....1...
Milium effusum	..1+.....11.....+++.++.1+.+.+1.....1..+
Polemonium coeruleum	.++1...1.....1.....1.++1.+1+.....+.1.+...+.....
Euphorbia discolor	+.+...+.+.+...+.....+.....+++.r.+.....+...r.....+.....
Pyrola rotundifolia	.....1.....+.....2+.....++..++.....1.....21++2...1+.....
Aegopodium alpestre	111.....+.....1+.1...+2.....2.2....11.r.....1+.....
Bistorta major	.++.....+.....+.+++.....+...1.....++.....
Euphorbia pilosa	+.+..+.+....+.....+.....++1+++.1+.+.....
Cypripedium guttatum	..+.....1.....++...+.++.....+.....+.....+++++....+.....
Artemisia sericea	.....+.....2.....+.....+.....+.....+.....+....1..++.....1.2+.+...r.r
Ranunculus polyanthemos	.....+..+.+++.....++..++.+.....1.....1.....+....rr
Lathyrus frolovii	+11.1++11.....+111+.....r.....
Pyrola incarnata	.....+1+.....1...+..1.....+.....1.....11.1+++.....
Achillea millefolium	.....++.++.....+1..+.++.....+.+.++r
Primula macrocalyx	1+.2..+1+.....1.....11.+.....+.....++.r.
Vicia sylvatica	.1..1.....+.....+...1...1+.1...1..+21.....1.....r.....
Polygala comosa	.....+.....+...r.....+.1...+++.....+..+.+.rr+.....
Anemone sylvestris	.....+....1.....+..+.....+.++.1.+..+.....+.11.+.....
Veratrum nigrum	....+..+..++.++.....+.....1..+.+rr....+.+.....
Geranium sylvaticum	.....+.1....+.....++.....111.....r.....+1+.+.
Tephroseris integrifolia	+.....+....+.....+.+.+.+.1rr.+.....r.....+.....
Viola arenaria	.....+.+..+.....1.....+.....1.....2..++.....+.....+++.....
Vicia megalotropis	+++.++.1+.....+.....+.+...+1.....1.....
Trommsdorfia maculata	....+.+...++....+..+1.+.....+.....1...r.....++....
Potentilla fragarioides	....+1....+.....+.....+.....1r..++11++.....
Crepis praemorsa	.+.....11.+..+.....1.....+.+r.....+...+.....+.....r..
Paris quadrifolia	.....+.+1.....+.+...++1.+.+1.....+.....+...
Gentiana macrophylla	+..+....+.....+++.....+...rr.....+++.....
Filipendula ulmaria	.....+.....+...+++.+1.....1..1.....+.+..r
Stellaria bungeana	.....11.....1+2111..+11.+.....+.....
Betula platyphylla	.....33.....1.....14441441.21.....
Iris uniflora	.....+.....++221122+22.....
Rhytidiadelphus triquetrus	+.....11+.....2.....+.+.1...+..+.....+.r..
Elymus gmelinii	+.....+.....1...+..11.1.....+1+++.....
Abietinella abietina	.....4.+1111..21.....211..1.....

Table XIII (continuation)

Relevé nr.	1111111111222222222233333333334444444444555555555566666666667777777777888888888899 12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Vaccinium vitis-idaea	..r.....22...1.1.....1....211..2.....+.....1.....
Fragaria orientalis	.....2.....2.....2222121222.....
Saussurea elongata	.....+.....1++11.11++11.....
Primula cortusoides	+.....++.+..+.....+.....++..+.11r.....
Pinus sibirica	.....+...+.....1.....r+.+....++.....+.....+.....r.....+.....
Bistorta vivipara	.....+.....11+1..+.11.....++.++.....
Adenophora lamarckii	....+1.11+.....1..+.....1...+.....+...rr.....
Adoxa moschatellina	+..+.....+.....++++++.+.+.....+.....
Luzula pilosa	.++...+.....+...r...++.+...++.....++...
Elytrigia repens	+..+.....+.1.....+.....1.....+.....2r.....+...+.+
Geranium eriostemon	.....1.....1.....1+1+11.+11.....
Adenophora liliifolia	1.....++.....+.....2....+.....1++.r.+
Potentilla matsuokana	.....++.111+.+...1...+..+...1.....
Vicia amoena	.....+..1.....+..+1+11+.+.+.....
Carex obtusata	.....+.....+..++1.....11++1..1.....
Aquilegia sibirica	.++.....+.....++...+.+.....+....1+.....r.....
Athyrium filix-femina	..+.....1.....+212+.1+.+.....+.....
Cirsium heterophyllum	.....+.....1....1+.+1.+.....+..1.....+.+...
Orthilia secunda	.....++.....+.....+.....+.....1+.....+.....r.....++....
Anemonastrum crinitum	.+.....1.....1..+...1.....+.....1..1.....++..1.....
Aegopodium podagraria	.....+.....3.....12.....22.....+21.+1
Viola canina	.....+....+.....+...+.....rr.....+++.+1
Veronica incana	.....r.....+11+.+rr.1.r.....
Veronica chamaedrys	....11.....+.....+.....++++r+.
Carex lanceolata	.....1+11++2.111.....
Hylocomium splendens	.....11+.....+.....+.....r.....+.+.....+..+..
Artemisia macrantha	.....+1...+.....1111.....1..+.....1.....
Heracleum sibiricum	.....+11..+.+1.....+.....+.+...+
Veratrum lobelianum	..+.....+.....+....++.+.+1.....+.....+.....
Kitagawia baicalensis	.....+.....+.1+.++..+1+.....+.....
Ptilium crista-castrensis	.....+111.....1....+.....+.....+..+.r..
Sedum aizoon	.....+.....+.....r++++..++...+.....
Anemonoides reflexa	.+..++.+.....+...+.....++++.....
Silene nutans	.+.....+..+.....+.....++.....+...+rr
Rhododendron dauricum	..+.....+.....12.....111.....+....+1.....
Festuca pseudovina	.....2..r.....121+121.....+
Cypripedium macranthon	.....++.....r...+.....++.....+.....+.+....+.....
Artemisia latifolia	.....1+.....1+.++..+.....+..1.....+.....
Ranunculus monophyllus	1.....+.+.....1.....+..1+.+.+.....+.....
Paeonia anomala	+..+...+11.....+.....+..+...1.....1.....
Aconogonon alpinum	.....+....+.+...+....+.....+.....+.+.....++.
Astragalus membranaceus	.....1.....1+..++.++111.....
Artemisia integrifolia	....++.+.....+.....+++++....+.....
Elymus mutabilis	1..1.....+....+.....+...1+.....++.....
Dianthus versicolor	.....+.....+.+.r++++.....r..
Helictotrichon pubescens	.....++..1.....+.....1+.....+...1r.....
Geum aleppicum	...+.....++.....+.+...+.....+..r.....+.....
Veronica krylovii	...+...+..+.....++..++.r.+.....
Aulacospermum anomalum	.....1.....+2.....++.++..11.....
Lilium pensylvanicum	.....+.....++++++.+.+.....
Malaxis monophyllos	.....+.r.....+.....++++.+..+.....
Plantago urvillei	.....+....+.....++...+.....+.+r.....r
Anthriscus sylvestris	+..+.....+.....2.....1..+.+..++.....
Urtica dioica	.....+2.....11+.+.+.+.....+...
Geranium albiflorum	.+1.....1...1.111.....1.....
Ranunculus japonicus	.....+1.....r.....+1+++.....
Pedicularis resupinata	.+...+..+.....+...+.....+.....+.++.....
Allium strictum	.....+.....+.....+..++rr+.....
Potentilla chrysantha	...+..++.....2.....1.....1...+..1.....
Cotoneaster uniflorus	.....212...211.....+...3.....
Sorbus sibirica	.....1.....+.....+.+1...+...+.....1.....
Hemerocallis minor	....+1.+.....r...++.....+r.....
Salix caprea	.....+.1..+.....+..+....+r+.....
Helictotrichon schellianum	.....21.....1..+.r1.....1.....r..

Table XIII (continuation)

Relevé nr.	111111111122222222223333333333444444444455555555556666666666777777777788888888899 123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Artemisia gmelinii	.....+.....+.....r..++...1..1.+.....
Filipendula stepposa	.....+..+.....+.....++.....+.....1.....+.....
Calamagrostis obtusata	.....+.....+.11+1.+..+.....
Silene repens	.....+.+....+.....+....++.....+.r
Calamagrostis langsdorffii	.....1..1.1.....2221.....r.....
Pedicularis verticillata	.....+++++..r+.....
Ranunculus propinquus	.....+.....+.....1+.+..++.....
Poa botryoides	.....1...1++...+...++.....
Poa pratensis	.....+.....2..+...+.....4.....1..+...
Poa attenuata	.....++.211.+.....1.....
Polemonium chinense	.....1.....+.....+++1+.....
Peucedanum morisonii	.....+...1+..+.....+..+..+.....
Schizonepeta multifida	.....+..++.12..1.r.....
Poa angustifolia	.....1...+.....111+2.....
Phleum phleoides	.....+.....r.....11.1.1.....r..
Hylotelephium triphyllum	....+.....+.....+.....+.....+.r.r
Hedysarum neglectum	.....++.....112..+1.....
Tragopogon orientalis	.....+....+.....+.....r.....r....+.....r..
Trientalis europaea	.....++.....+.....++.....++....
Gypsophila altissima	.....+.....+.....+.....rr+..+.....
Lonicera altaica	.....1+2+...11..+.....
Koeleria cristata	.....1+++....1r.....+.....
Trollius europaeus	.....1..2.....+.....++++...
Lamium album	.....+.....+.++..+++.....
Vicia nervata	.....+.....+..1+1+.....1.....
Thalictrum appendiculatum	.....11+++1...+.....
Neottianthe cucullata	.....+.++.....+.....+.....++.....
Melilotoides platycarpos	.....+.....+.....+.1.11.....1.....
Oxytropis ambigua	.....+..111+.+.....1.....
Geranium vlassowianum	.....11.....21222.....
Thesium repens	.....+.....+.....1.....+1+.....+.....
Geranium pratense	1..1.+.....1.....+.....1..2.....
Thalictrum simplex	.....+....+...11.....+.....1....+.
Abies sibirica	.....+.....2.....2+.12...+.....
Cirsium serratuloides	1...++.....1.....1...+.....+.....
Achnatherum sibiricum	.....r.+.+.....11r+.....
Campanula rotundifolia	.....r.....+....1++.....+.....+.....
Astragalus adsurgens	.....1.....1.++.....+1+.....
Artemisia armeniaca	.....+....+.....+.....+...+r+
Zigadenus sibiricus	..+....++.....+.+.....r.....
Viola gmeliniana	.....++.....++++.....
Ptarmica impatiens	.++.....+.....+.....+.+.....
Aconitum krylovii	1.1.....1.++1.....
Salix pyrolifolia	.....+.+++.+.+.....
Viburnum opulus	.....+..1..+.....+.+.+.....
Abies sibirica	.....+...
Achnatherum confusum	.....+.....
Aconitum sp.	.....+.....
Aconitum altaicum	.....+..+.....
Aconitum ambiguum	.....++.....
Aconitum anthoroideum	...+r.r.....+.+.....+.
Aconitum decipiens	.....+.....
Aconogonon angustifolium	.....+.....
Adenophora pereskiifolia	.....++...+.....
Adenophora stenanthina	.....+.r.....
Actaea erythrocarpa	.....+.....+.....
Adenophora coronopifolia	.....+.1.....r.....+....+.....
Adenophora sublata	.....1.....
Adenophora tricuspidata	.....1.....+1++.+.....
Adonis sibirica	+.....1.....1..rr.....+....
Adonis vernalis	.....+.....
Agropyron cristatum	.....+.....
Agrostis sp.	.....+.....
Agrostis gigantea	.....+.....+.....+.

Table XIII (continuation)

Relevé nr.	1111111111222222222233333333334444444444555555555566666666667777777777888888888899 12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Agrostis tenuis	.....+.
Agrostis vinealis	.....r.....
Alchemilla sp.	.....1.+.
Allium anisopodium	.....++.....
Allium clathratum	.....+.....
Allium microdictyon	.....+....++.....
Allium nutans	.....1.....+.....
Allium rubens	.....+.....
Allium splendens	.....++.....+...+.....+.....+.....
Allium tenuissimum	.....+.....+.....
Alopecurus sp.	.....r.....
Alopecurus pratensis	.....+.....
Alyssum obovatum	.....+.....+.....
Amblystegium serpens	.....r.....+.....+
Amblystegium varium	.....r.....
Amoria montana	.....1.....
Androsace incana	.....+.....
Androsace septentrionalis	.....+.+.....+...1+.+.....
Anemonoides altaica	.....1.....++1++.....
Anemonoides caerulea	..+...+.....++.11.....
Anemonoides jenisseensis	....+...++.....++.....
Anemonastrum biarmiense	.....+.....
Anemonidium dichotomum	.....+.....
Antennaria dioica	.....+.....++...1..+.....+..
Anthoxanthum odoratum	..+.....
Arabis pendula	...+.....+.....
Artemisia commutata	.....+.....
Artemisia dracunculus	.....+.....+.....
Artemisia frigida	.....+.....
Artemisia laciniata	.....1..r.....
Artemisia leucophylla	.....r.....
Artemisia pontica	.....+.....
Artemisia rupestris	.....+.....
Artemisia santolinifolia	.....+.....+.....+.....+.....
Artemisia vulgaris	.....+.....+.....+.....+...r.....
Asarum europaeum	.....+.....+.....
Asparagus officinalis	.....+.+.....
Aster tataricus	.....++..+++.....
Astragalus alpinus	.....1.....
Astragalus austrosibiricus	.....+.....
Astragalus ceratoides	.....++...+.....
Astragalus danicus	.....+.....+...+...+.....2.....+.....
Astragalus frigidus	.....++.....
Astragalus glycyphyllos	.....+.....
Astragalus multicaulis	.....+.....+.....
Astragalus propinquus	.....+.....
Astragalus suffruticosus	.....+.....++.....
Aulacospermum multifidum	.....+..
Bergenia crassifolia	.....r.....++.....
Berteroa incana	.....+.....r.....
Betula fruticosa	.....+.....
Betula pubescens	.....+.1...
Bistorta alopecuroides	.....+.....+.....
Botrychium lunaria	.....+.....
Brachythecium oedipodium	.....+.
Brachythecium reflexum	.....+.....+
Brachythecium salebrosum	.....+.....++
Brachythecium velutinum	.....+.
Bromopsis inermis	1.....1.
Brunnera sibirica	....1.....22.....
Bryoria sp.	.....r..
Bupleurum scorzonerifolium	.....+.....1.r.1+.....+.....
Bupleurum sibiricum	.....1.....
Calamagrostis korotkyi	.....+.....++.....

Table XIII (continuation)

Relevé nr.	111111111122222222223333333333444444444455555555556666666666777777777788888888899 123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Calamagrostis pavlovii	.....22.....2.....1..1.....1.....
Callicladium haldanianum	.....r.....
Campanula altaica	..+..+....+..+.....
Campanula persicifolia	.....r.r
Campanula sibirica	.....++.....
Campanula turczaninovi	.....r.....
Caragana frutex	.....1.1
Caragana pygmaea	.....112.+.....
Carex argunensis	.....1+.....
Carex arnellii	.....+.....
Carex caryophyllea	.....++.....+.....+...+..
Carex digitata	.....++.r..
Carex duriuscula	.....+.....
Carex ericetorum	.....++.....
Carex humilis	+..+.....1.....
Carex korshinskyi	.....+.....
Carex media	.....+.....
Carex pallida	.....11.+.....
Carex pallescens	.....+.....+.....
Carex praecox	.....++2.....+.....
Carex rhizina	.....+.....++
Carex schmidtii	.....++.....
Carex supina	.....+.....2.....
Carex tomentosa	.....+.....
Carex vaginata	.....+.....
Carduus crispus	...+.....
Cenolophium denudatum	.....+.....
Centaurea scabiosa	.....+.....+.....
Centaurea sibirica	.....+.....+..
Cerastium arvense	.....++.....+..+.....
Ceratodon purpureus	.....+
Cerasus fruticosa	.....3.....r.....
Chamaecytisus ruthenicus	.....1.....+.+.+++
Chamaerhodos erecta	.....r.....
Chimaphila umbellata	.....+.....
Cicerbita azurea	.....+....1.....
Cinna latifolia	.....+.....
Circaea alpina	.....1.....1.....
Cirsium setosum	.....+.....
Cladonia chlorophaea	.....+.
Cladonia cornuta	.....+.
Cleistogenes squarrosa	.....+.....
Clematis integrifolia	.....+.....
Climacium dendroides	.....+.....+.....
Coeloglossum viride	.....++.....
Corydalis bracteata	.....++.+.....
Crataegus sanguinea	....+.....+.....+.....
Crepis sp.	.....+.....
Conioselinum tataricum	.....++..+.....
Coluria geoides	.....+....+.....1...1.....
Crepis bungei	.....++.....
Crepis flexuosa	.....+.....
Crepis lyrata	.....+.....
Cynoglossum officinale	.....r
Dactylorhiza fuchsii	..+.....+...+.....r.....
Dactylorhiza maculata	.....+...+..+.....
Dactylorhiza majalis	.....+.....
Daphne altaica	.....+.....
Daphne mezereum	.....+.....+....
Delphinium sp.	.....+.....
Delphinium crassifolium	.....+.....1.....
Delphinium elatum	.....1.....+.....
Delphinium grandiflorum	.....+.....
Delphinium laxiflorum	.....1...+.....

Table XIII (continuation)

Relevé nr.	1111111111222222222233333333334444444444555555555566666666677777777778888888899 1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Delphinium retropilosum	.....+.....1.....+..+.....
Dendranthema sinuatum	.....+.....
Dentaria sibirica	.....+.....
Deschampsia cespitosa	.....+.....
Dictamnus albus	.....+.....
Dicranum sp.	.....+.....1.....+..
Dicranum congestum	.....r.....
Dicranum fuscescens	.....+.....
Dicranum scoparium	.....+.....
Dicranum spurium	.....1.....
Digitalis grandiflora	.....+++r+.
Diplazium sibiricum	.....+.....1.....
Draba cana	.....+.....+.....
Draba sibirica	.....+..++.....
Dracocephalum nutans	.....+....+.....
Dryas oxyodonta	.....+.....
Dryopteris carthusiana	.....r.....
Dryopteris expansa	..+.....+.....+.1.....+.....+...
Dryopteris filix-mas	.....r.++.....
Duschekia fruticosa	.....+...+1.....1.....
Elymus caninus	+..+.+.....+.....+.....+.....
Elymus confusus	.....1+..+...1.....
Elymus ircutensis	.....+.....
Elymus komarovii	+..+.....+.....1.....+.....
Elymus sajanensis	.....1..11.1+.....
Elymus sibiricus	.....+.....+.....+.1...+.....
Elymus transbaicalense	.....+.....
Elytrigia gmelinii	...+.....+.....
Empetrum nigrum	.....+.....
Entodon sp.	.....+.....
Epilobium montanum	.....+.....
Epipactis helleborine	.....r.....r.....+...r
Equisetum hyemale	.....+.....+.....++.....
Equisetum scirpoides	.....r.....
Equisetum sylvaticum	....+.....1...2+.....+.....
Erigeron acris	.....r.....
Eritrichium pectinatum	.....+.++..+...+.....
Eritrichium villosum	.....+.....
Eryngium planum	.....+.....+.+.....
Erysimum hieracifolium	.....+.....r
Euphorbia alpina	.....+.....++.+.....
Euphorbia subcordata	.....+..
Euphorbia virgata	.....+.....+.....
Euphrasia parviflora	.....+.....1.....
Eurhynchium sp.	.....+.....++...
Evernia mesomorpha	.....+..
Festuca altaica	.....22.+1.....
Festuca altissima	.....+.....
Festuca gigantea	.....+.....
Festuca kryloviana	.....22..+1.+.....
Festuca pratensis	.....1.....
Festuca rubra	..+.....+..+.....+1.....+.....
Festuca rupicola	.....+..
Festuca sibirica	.....1.....
Festuca valesiaca	.....1.....
Filifolium sibiricum	.....+.1.....
Filipendula palmata	.....2.....
Frangula alnus	.....+.....
Galeopsis bifida	.....+.....r.
Galatella angustissima	....++.....+.....r.+.....
Galatella biflora	.....1...+.....1+.....+.....r
Galatella dahurica	.....+...+...+.....
Galatella macrosciadia	.....+.++.....+.....+.1.....
Galium album	.....r

Table XIII (continuation)

Relevé nr.	111111111122222222223333333333444444444455555555556666666666777777777788888888899 123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Galium aparine	..........+....
Galium mollugo	..........+....
Galium paniculatum	1.....1.....11..1....
Galium ruthenicum	.....
Galium tinctorium	.....+.....+.....1.....r
Gentianella amarella	.....+.....
Genista tinctoria	.....+.....
Gentianopsis barbata	.....+.....
Gentiana decumbens	.....1.+.....1+.....
Geranium bifolium	.....1+.....1..1.11.....
Geranium sibiricum	.....+.....
Geum rivale	.....+.....+...
Geum urbanum	.....+.
Glechoma hederacea	.....+.....+...1.....+.....r
Goniolimon speciosum	.....+.....+.....
Goodyera repens	.....r.....+.....
Gymnadenia conopsea	.....r.....+.....
Gymnocarpium dryopteris	.....++.....+...+.....
Gypsophila sericea	.....+.....
Hedysarum alpinum	.....++1.....
Hedysarum gmelinii	.....+..1.....
Hedysarum inundatum	.....+.1.....+.....
Hedysarum minussinense	.....1.....
Helictotrichon altaicum	.....1+...2.....
Helictotrichon desertorum	.....2.....
Helictotrichon hookeri	.....+++.....
Heteropappus altaicus	.....++.....
Heteropappus biennis	.....+.....+.....
Hierochloe odorata	.....r.....r.....
Hieracium sp.	.....+.....
Hieracium echioides	.....+.+.....
Hieracium korshinskyi	.....+.....
Hieracium pilosella	.....++.....
Hieracium virosum	.....r.....+.....
Humulus lupulus	.....1.....+.+.....
Hylotelephium caucasicum	.....+.
Hylotelephium populifolium	.....+.....
Hypnum pallescens	.....1.....2....++
Hypericum elegans	.....+.....
Hypericum perforatum	.....+.....+.
Hypogymnia physodes	.....+..
Hypogymnia tubulosa	.....+..
Impatiens noli-tangere	.....+.....
Inula aspera	.....+.
Inula britannica	.....+.....
Inula hirta	.....r
Iris bloudowii	.....+.....
Iris humilis	.....2.+.....
Iris sanguinea	.....+.....
Iris tigridia	.....+.....
Ixeridium chinense	.....+.....
Juniperus pseudosabina	.....+.+.....
Juniperus sabina	.....+.....+...+.....
Juniperus sibirica	.....1.1.....
Kadenia dubia	.....11+.1++.....
Kitagawia terebinthacea	.....+..+.....
Knautia arvensis	.....+.....
Kobresia myosuroides	.....1+2.....1.....
Koeleria altaica	.....+.....
Koeleria glauca	.....1.....
Lappula squarrosa	.....+.....
Larix gmelinii	.....1.....+...+.+.+4.....
Ledum palustre	.....+1.....
Leibnitzia anandria	.....++.....+.....

Table XIII (continuation)

Relevé nr.	1111111111222222222233333333334444444444455555555556666666666777777777788888888899 12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Leontopodium conglobatum	.....+.....
Leontopodium leontopodiodes	.....+.....
Lespedeza davurica	.....+.....
Lespedeza juncea	.....11.....1.....
Leucanthemum vulgare	.....+.....+.....
Ligularia fischeri	.....11+1+.....
Ligularia glauca	1.....1.....+.....
Lilium pumilum	.....1.....
Linaria acutiloba	.....+.....
Linaria vulgaris	.....r.....r+.
Linnaea borealis	.....+.....
Linum perenne	.....+.....
Lithospermum officinalis	...+.....
Lonicera hispida	.....+.....
Lonicera microphylla	.....1.....
Lonicera pallasii	.....+.....+.....
Lonicera xylosteum	.....+.....+...
Lophocolea heterophylla	.....r.....
Lycopodium annotinum	.....+.....r.....
Lychnis sibirica	.....+..+.....
Lysimachia vulgaris	....+.....+..+...1.....+.....
Matteuccia struthiopteris	.....+.....r.4.2.....1.....
Medicago falcata	.....+.....++.....
Melampyrum cristatum	.....r..
Melampyrum pratense	.....+.....
Melica altissima	.....+.....
Melanelia olivacea	.....+..
Melilotoides ruthenica	.....+.....
Melandrium album	....+.....+.....+.....
Minuartia verna	.....+.....+.....
Mitella nuda	.....r.....
Mnium sp.	.....1.....
Moneses uniflora	.....+.....
Myosotis asiatica	.....+1.1.....1.....
Myosotis imitata	.....+.....+...+.....1.....
Myosotis krylovii	..+.....+.....
Myosotis sylvatica	.....1...
Noccaea cochleariformis	.....+.....
Oberna behen	+.....+.....
Onobrychis tanaitica	.....++...+.1.....
Onosma simplicissima	.....1.....
Orobanche coerulescens	.....+.....
Orostachys malachophylla	.....+++.....
Orostachys spinosa	.....+..+.+.....
Orthodicranum montanum	.....+.
Osmorhiza aristata	.....+.....
Oxalis acetosella	.....1.....+..1.....2...
Oxytropis caespitosa	.....+.....
Oxytropis myriophylla	.....1+.....1+.....
Oxytropis recognita	.....+.....
Oxytropis strobilacea	.....+.....+.r.....
Pachypleurum alpinum	.....1+1..1.....
Parmeliopsis ambigua	.....+..
Parnassia palustris	.....+...+.....
Parmelia sulcata	.....+..
Patrinia rupestris	.....+....2++.....+1.....
Patrinia scabiosifolia	.....1....++.....
Patrinia sibirica	.....+.....
Pedicularis sp.	.....r.....
Pedicularis achilleifolia	.....+.....
Pedicularis amoena	.....+.....
Pedicularis compacta	.....+++..+.....
Pedicularis elata	.....+.....1+.....1.....
Pedicularis incarnata	..+...+.....+.....

Table XIII (continuation)

Relevé nr.	111111111122222222223333333333444444444455555555556666666666777777777788888888899 123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Pedicularis labradorica	.....r.....+....+.....
Pedicularis lasiostachys	.....+1.....
Pedicularis palustris	.....+.....
Pedicularis rubens	.....r..1.....+.....
Pedicularis semenowii	.....1.....
Pedicularis sibirica	.....+..+1r.....
Pentaphylloides fruticosa	.....++.....1.....
Peucedanum vaginatum	.....+.....+1.....
Phegopteris connectilis	.....+.....+.....
Phleum pratense	.....+.....
Phragmites australis	.....1.....
Picea obovata	.....+.....+.....+.....
Pimpinella saxifraga	.....+.....+.....
Platanthera bifolia	.....+.+.....r....+.....+.....
Platygyrium repens	.....+.....
Plagiomnium cuspidatum	.....+.....+.....+.....++..+
Plantago major	.....+.....
Plantago media	.....r.....2.....
Plagiothecium laetum	.....+...
Poa nemoralis	.....+.....+.....11.....1+
Poa transbaicalica	.....+.....1.....11.....+..
Poa trivialis	.....+.....
Pohlia sp.	.....+
Pohlia nutans	.....r.....+....+.
Polemonium boreale	.....+..111.r.....
Polygala sibirica	.....+.....
Polytrichum strictum	.....+.....r.....
Polygonatum humile	.....1....+.....1.....++.....r.....
Polypodium vulgare	.....+.....
Potentilla acaulis	.....1.....+.....
Potentilla bifurca	.....r.....
Potentilla conferta	.....+....+.....
Potentilla erecta	.....+.....++....
Potentilla flagellaris	.....1.....r.....
Potentilla gelida	.....+.....
Potentilla humifusa	.....r.....
Potentilla longifolia	.....r.....+.+.....
Potentilla nivea	.....r+.....1...++.....
Potentilla nudicaulis	.....+.....+.....
Potentilla sericea	.....+.....
Potentilla tanacetifolia	.....2.+.....
Primula abchasica	.....+
Prunella vulgaris	.....+.....+...
Pseudevernia furfuracea	.....+..
Ptarmica alpina	.....+..+.....
Ptilidium pulcherrimum	.....+.....
Pulsatilla ambigua	.....+.....
Pulsatilla turczaninovii	.....+.....11+.....
Pylaisiella polyantha	.....+.....+
Pyrethrum corymbosum	.....+.
Pyrola chlorantha	.....r.....+.+.....+.....
Pyrola media	.....+.....
Pyrola minor	.....+.+...
Quercus robur	.....1.
Ranunculus acris	.....+.....+++...
Ranunculus auricomus	.....+++...
Ranunculus grandifolius	..1.....1+1..1.....
Ranunculus pedatifidus	.....+.....
Rhodiola rosea	.....+.....
Rhodobryum roseum	.....1.....+1.....1.....++....
Ribes atropurpureum	.....+.....+.....
Ribes diacantha	.....+.....
Ribes hispidulum	...+.....+..+.....
Ribes nigrum	.....+.....+.....

Table XIII (continuation)

Relevé nr.	1111111111222222222233333333334444444444555555555566666666667777777777888888888899 12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Rosa davurica	.....1+.....
Rosa pimpinellifolia	.....+.....+.....11.....1.....
Rubus idaeus	.....++.....1...
Rubus matsumuranus	...+.....+.....+.....
Rumex thyrsiflorus	.....r.....
Salix abscondita	.....+.....
Salix bebbiana	.....1.....+.....+.....
Salix pseudopentandra	.....+++..2.....
Salix rhamnifolia	.....+.....
Sanicula europaea	.....+.....
Sanicula giraldii	.....++.....
Sanionia uncinata	.....+.....1...+..
Saposhnikovia divaricata	.....1+.....
Saussurea alpina	.....++1+.....
Saussurea elata	.....+.....
Saussurea latifolia	.....1....+.....
Saussurea parviflora	..+.....1.....
Saxifraga macrocalyx	.....+.....
Saussurea stubendorffii	.....+1.....
Saxifraga sibirica	.....+.....+.....
Scabiosa comosa	.....1++.....+.....
Scabiosa ochroleuca	.....+.....r.....
Scorpidium scorpioides	.....+.....
Scutellaria scordiifolia	.....+r..+.....
Sedum hybridum	.....r.....+.....+.+..1.....r
Sempervivum pumilum	.....+....
Senecio jacobaea	.....+.....
Senecio nemorensis	1...+.....1..1..1.....
Serratula gmelinii	.....r
Serratula marginata	.....1.....
Seseli condensatum	.....r.....
Seseli krylovii	.....+..
Seseli seseloides	.....+++1.+.....
Silaum silaus	.....+.....
Silene chamarensis	.....++++.....
Silene graminifolia	.....+.....
Silene jeniseensis	.....+.....+.....
Silene sibirica	.....+.....
Solidago dahurica	.....+.....
Sorbus aucuparia	.....12r..
Spiraea aquilegifolia	.....+.....
Spiraea hypericifolia	.....1.....
Spiraea pubescens	.....+.....
Spiraea salicifolia	.....+.....
Spiraea trilobata	.....1.....22..+2.....
Stachys officinalis	.....1.....1+++.+.
Stachys sylvatica	.....+.....1.....
Steris viscaria	.....r..
Stellera chamaejasme	.....1+.....1..+.....
Stellaria graminea	.....+...+.....+.....
Stellaria holostea	.....++1.+.
Stellaria palustris	.....r.....
Stellaria peduncularis	.....++...+.....
Stemmacantha uniflora	.....111.....+1.....
Stelleropsis altaica	.....+.....
Stevenia cheiranthoides	.....+.....
Stipa capillata	.....+.....
Stipa pennata	.....+..r.....
Succisa pratensis	.....+++...
Synurus deltoides	.....++++.+.....
Tanacetum vulgare	.....+++.....+.....
Taraxacum officinale	.....+.++.....+.....
Tephroseris kirilowii	.....+.....
Tephroseris porphyrantha	.....+.....

Table XIII (continuation)

Relevé nr.	111111111122222222223333333333444444444455555555556666666666777777777788888888899 123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901
Tephroseris praticola	.....1.1111.....
Thalictrum contortum	.....1.....
Thalictrum flavum	.....++....
Thalictrum petaloideum	.....++.11.....+.....
Thesium refractum	.....+....+.r.....+.....
Thymus serpyllum	.....++.....
Tilia cordata	.....+.
Trifolium medium	.....1.....+.....2....+r
Trifolium pratense	.....+...+.+.....+.....r.
Trollius ledebourii	.....+++1.....
Usnea hirta	.....r..
Vaccinium myrtillus	.....1.....
Vaccinium myrtillus	..r.....1...+.....+.....
Vaccinium uliginosum	.....1.....
Valeriana officinalis	.....+...
Valeriana wolgensis	.....+.....
Verbascum nigrum	.....+.
Veronicastrum sibiricum	.....1.+.....
Veronica longifolia	.....+..+.....
Veronica porphyriana	.....+.....+.....
Veronica spicata	.....+..
Veronica spuria	.....+.....+....+.
Veronica teucrium	.....1.....+....rr
Vicia baicalensis	.....2.....+.....
Vicia lilacina	.....++.....
Vicia popovii	.....+.....
Vicia pseudorobus	.....1.....
Vicia tenuifolia	.....+...1.....+.....+.....
Vicia venosa	.....1.....12.....1.....
Viola biflora	..+.....+.....
Viola collina	.....1.....++.
Viola dactyloides	.....++....+++.....
Viola dissecta	.....+.1.+.r.+.....
Viola disjuncta	.....+.....
Viola macroceras	.....+.....
Viola mauritii	.....+.....
Viola montana	.....+.....++.....
Viola persicifolia	.....+.....
Viola rupestris	.....1.....+.....r.....+..
Woodsia ilvensis	.....+.....+..+.....
Youngia tenuifolia	.....+..+.....1+.....
Ziziphora clinopodioides	.....+.....

Headings of relevés of Table XIII

1 Relevé nr.	2 Date	3 Area (m2)	4 Altitude m	5 Aspect (0°)	6 Slope (0°)	7 Cover t1 (%)	8 Cover s1 (%)	9 Cover h1 (%)	10 Cover ml (%)	11 Latitude (0°.0')	12 Longitude (0°.0')
1	1991.08.12	200	1250	202	30	60	15	65	3	51° 14'	85° 17'
2	1991.07.07	200	900	225	15	70	0	70	0	52° 59'	91° 11'
3	1985.07.14	200	1200	270	7	25	10	85	0	51° 27'	86° 05'
4	1991.08.17	200	1450	135	35	60	3	75	0	50° 19'	85° 49'
5	1994.08.02	200	600	180	17	55	5	85	2	53° 05'	92° 14'
6	1994.08.02	200	550	135	30	60	3	75	3	53° 05'	92° 14'
7	1986.09.11	200	500	180	15	60	5	80	3	51° 25'	83° 46'
8	1996.08.09	200	550	22	5	70	5	75	5	55°18'	89° 16'
9	1996.08.07	200	900	67	30	65	10	70	15	54° 10'	89° 40'
10	1991.07.18	200	1250	22	7	70	15	75	3	51° 59'	94° 07'
11	1994.06.21	200	290	45	1	60	1	75	0	54°17'	83° 11'
12	1993.07.17	200	270	0	0	60	20	40	0	54° 27'	85° 58'
13	1982.07.18	100	320	225	5	40	2	76	0	54° 32'	83° 59'
14	1991.06.13	200	260	0	0	60	0	60	0	55° 30'	86° 00'
15	1992.08	200	800	45	15	60	20	80	3	49° 22'	83° 10'
16	1969.07.12	100	350	200	3	60	2	45	0	55°25′	101°00′
17	1964.07.29	100	300	90	3	60	10	75	0	56°57′	97°25′
18	1987.08.25	100	660	315	20	50	70	100	30	51°19′	87°54′
19	1998.06.17	200	200	270	6	45	5	100	0	-	-
20	1993.08.16	200	550	270	2	50	5	70	0	53°08′	103°02′
21	1960.06.19	100	280	225	6	60	5	60	3	57°05′	94°50′
22	1984.08.16	200	550	247	27	35	30	55	3	51°15′	86°06′
23	1996.07.24	200	650	225	5	60	15	75	0	52°05′	107°10′
24	1970.07.02	100	850	360	5	50	2	90	0	-	-
25	1986.06.30	200	700	45	12	70	65	70	0	51°20′	87°55′
26	1985.07.31	200	550	292	15	45	15	70	0	51°58′	87°06′
27	1998.07.08	200	320	160	1	65	3	85	0	55°47′	86°42′
28	1985.08.03	200	450	315	5	75	8	65	3	52°12′	87°07′
29	1985.07.21	200	350	0	0	50	30	100	3	51°43′	85°46′
30	1991.08.22	200	700	337	7	50	2	70	15	51°24′	85°44′
31	1996.08.09	200	650	360	5	70	2	80	2	55°18′	89°16′
32	1994.08.02	200	500	360	3	55	3	90	3	53°05′	92°14′
33	1991.07.08	200	600	90	6	60	3	90	0	52°59′	91°11′
34	1991.07.18	200	900	360	3	60	3	70	3	51°59′	94°07′
35	1982.06	200	300	90	3	65	3	70	0	54°32′	83°59′
36	1969.09	100	200	0	0	60	0	95	0	54°49′	83°10′
37	1959.09.09	400	440	315	5	65	2	80	10	55°51′	98°00′
38	1993.08.19	200	800	337	10	50	5	80	3	51°46′	103°45′
39	1993.06.10	200	200	0	0	65	3	60	0	52°35′	81°25′
40	1994.06.15	200	250	0	0	55	5	70	0	53°21′	82°07′
41	1997.06.29	200	180	0	0	45	35	55	0	55°04′	63°16′
42	1993.06.09	200	200	0	0	60	25	60	3	52°54′	81°51′
43	1994.06.16	200	200	0	0	70	20	60	10	54°04′	81°15′
44	1997.06.28	200	150	0	0	65	2	65	0	55°28′	64°45′
45	1994.06.12	200	240	337	3	60	1	60	3	53°20′	84°10′
46	1997.06.25	200	180	270	5	45	2	85	0	56°18′	70°30′
47	1997.07.08	200	140	315	2	55	2	75	0	56°18′	70°30′
48	1993.07.07	200	1800	315	3	50	15	60	25	50°08′	87°48′
49	1995.08.16	200	2200	45	30	60	3	60	90	40°55′	91°46′
50	1993.07.11	200	1800	45	15	65	10	85	35	50°16′	87°55′
51	1993.07.09	200	2200	337	40	60	2	65	35	49°57′	89°08′
52	1993.07.09	200	2300	315	50	55	2	50	60	49°57′	89°08′
53	1995.08.18	200	2300	360	15	50	5	60	35	50°00′	90°57′
54	1993.07.11	200	2000	90	3	50	20	70	10	50°16′	87°55′
55	1993.08.01	200	2100	292	25	60	15	70	30	50°08′	88°18′
56	1993.07.31	200	2200	270	50	50	20	65	15	50°08′	88°18′
57	1974.07.14	100	1550	90	8	60	2	90	2	-	-
58	1971.08.16	100	2100	45	20	50	2	40	50	-	-
59	1975.07.30	100	1900	45	7	55	2	65	10	-	-
60	1975.07.21	350	2320	360	5	70	0	60	10	46°50′	100°05′
61	1997.07.03	200	350	23	8	60	2	70	2	54°50′	60°38′
62	1986.06.11	200	650	225	60	30	40	70	0	51°34′	85°55′

Headings of relevés of Table XIII (continuation)

63	1986.06.05	200	700	225	30	55	30	70	80	51°18′	86°04′
64	1991.07.15	200	850	180	25	50	15	65	5	52°24′	93°16′
65	1991.07.07	200	800	202	12	50	30	65	5	53°01′	91°09′
66	1991.08.15	200	1250	90	25	70	2	60	20	50°57′	85°03′
67	1986.07.26	200	1300	157	15	40	15	40	3	50°49′	88°36′
68	1996.07.07	200	550	45	30	70	5	50	40	54°55′	88°25′
69	1995.07.28	250	500	0	0	40	0	80	-	55°05′	89°59′
70	1995.07.20	250	520	270	3	35	0	40	-	54°17′	90°35′
71	1993.07.11	200	1600	315	60	60	40	45	30	50°15′	87°55′
72	1996.07.26	200	800	360	15	68	2	55	15	50°47′	106°32′
73	1996.07.31	200	1000	202	8	60	0	30	0	51°31′	112°37′
74	1974.08.03	100	900	360	3	60	2	30	2	-	-
75	1992.07.21	200	900	90	2	65	1	70	0	50°02′	113°20′
76	1992.07.09	200	850	360	5	60	1	65	3	50°23′	114°18′
77	1992.07.07	200	900	180	2	60	1	75	0	50°23′	114°18′
78	1996.07.31	200	850	67	3	60	8	75	0	51°31′	112°37′
79	1996.07.28	200	950	225	3	60	2	75	0	50°16′	108°22′
80	1992.07.22	200	900	45	5	60	25	50	1	50°02′	113°20′
81	1992.07.19	200	700	225	5	60	1	20	1	50°14′	113°20′
82	1996.07.19	200	900	90	20	45	5	70	0	51°15′	109°29′
83	1996.07.28	200	1100	225	5	65	5	75	2	50°09′	107°48′
84	1996.07.30	200	900	90	3	65	3	70	2	51°13′	112°01′
85	1997.07.01	200	400	203	7	65	3	75	0	54°48′	60°40′
86		-	100	-	-	-	50	1	50	80	-
87		-	100	-	-	-	60	1	90	1	-
88	-	100	-	-	-	60	25	60	5	-	-
89	-	600	-	180	8	50	7	20	8	-	-
90	-	625	-	-	-	40	10	70	10	-	-
91	-	1000	-	-	-	70	3	70	0	-	-

Relevé nr.	Relevé nr. in database	Localitetes of relevés 1-91
1	16011	Russia, Altai Republic, Shebalinskiy raion, near Baragash, 9 km SE, the Kuvash river basin
2	15721	Russia, Khakassia, Beiskiy raion, near Bogoslovka, 3 km W, the Uy river basin
3	15412	Russia, Altai Republic, Shebalinskiy raion, the Kujum river basin, 5 km from the Katun.
4	16040	Russia, Altai Republic, Ust-Koksinskiy raion, near Terehta, 5 km NWW
5	15734	Russia, Krasnoyarskiy krai, Ermakovskiy raion, near Migna, 5 km S, foothills of the West Sayani
6	15746	Russia, Krasnoyarskiy krai, Ermakovskiy raion, near Migna, 6 km S, foothills of the West Sayani
7	16753	Russia, Altaisky krai, Charyshsky raion, near Borovlyanka
8	17169	Russia, Krasnoyarskiy krai, Sharypovskiy raion, near Parnaya, 5 km NE
9	17164	Russia, Khakassia, Shirinskiy raion, near Topanov, 3 km S
10	16849	Russia, Tuva Republic, Turanskiy raion, near the Kalbak-Aga mountain, the Begreda river basin
11	15055	Russia, Novosibirskaya oblast, Cherepanovskiy raion, near Gribnoy, 4 km W
12	15101	Russia, Kemerovskaya oblast, Leninsk-Kuznetskiy raion, near Ur-Bedari
13	15084	Russia, Novosibirskaya oblast, Maslyaninskiy raion, near Beryozovsky
14	15088	Russia, Kemerovskaya oblast, Promyshlenniy raion, near Pushkino
15	15125	Kazakhstan, Vostochny-Kazakhstanskaya oblast, Samarskiy raion, near Panteleimonovka
16	17466	Russia, Irkutskaya oblast, Bratskiy raion, near the Iya river, the Angara river basi
17	17401	Russia, Krasnoyarskiy krai, Dolgomostovskiy raion, near Pokoteevo, 8 km SE
18	16407	Russia, Altai Republic, Ulaganskiy raion, the Kyga river basin
19	18435	Russia, Novosibirskaya oblast, Iskitimskiy raion, near Kiternya
20	16615	Russia, Irkutskaya oblast, Cheremkhovskiy raion, near Cheremkhovo
21	16210	Russia, Krasnoyarski krai, Bolshemurtinskiy raion, near Kazanka, 5km S.
22	15447	Russia, Altai Republic, Shebalinskiy raion, near Elanda, 2 km N
23	17242	Russia, Buryatia Republic, Kabanskiy raion, near Talovka
24	17620	Mongolia, Selenga aimak, near the Buhmety-Gol, the Eroo river basin
25	16787	Russia, Altai Republic, Ulaganskiy raion, the Kyga river valley, 14 km from Teletskoe lake
26	15932	Russia, Altai Republic, Turochakskiy raion, near Kebezen, 7 km N
27	18555	Russia, Kemerovskaya oblast, Izhmorskiy raion, near Glukharinka, 2km E
28	15902	Russia, Altai Republic, Turochakskiy raion, near Turochak, 7 km S
29	15401	Russia, Altai Republic, Maiminskiy raion, near Muny
30	16046	Russia, Altai Republic, Shebalinskiy raion, near Miyuta, 8 km EEES
31	17174	Russia, Krasnoyarskiy krai, Sharypovskiy raion, near Parnaya, 5 km NE
32	15729	Russia, Krasnoyarskiy krai, Ermakovskiy, near Migna, 6 km S, the foothills of the West Sayani
33	15755	Russia, Khakassia, Beiskiy raion, near Bogoslovka, 5 km W

34	16840	Russia, Tuva Republic, Turanskiy raion, the Kalbak-Aga mountain, the Begreda river basin
35	15123	Russia, Novosibirskaya oblast, Maslyaninskiy raion, near Beryozovo
36	15147	Russia, Novosibirskaya oblast, Sovetskiy raion, Central Siberian Botanical Garden
37	17314	Russia, Ircutskaya oblast, Taishetskiy raion, near Kozino
38	16620	Russia, Irkutskaya oblast, near Irkutsk 35 km SE
39	15609	Russia, Altaiskiy krai, Romanovskiy raion, near Romanovo, 10 km E
40	15016	Russia, Altaiskiy krai, Krutishinskiy raion, near Makarovo, 12 km NE
41	18329	Russia, Kurganskaya oblast, Shumikhinskiy raion, near Sazhino, 5 km W
42	15615	Russia, Altaiskiy krai, Mamontovskiy raion, near Kadnikovo, 3.5 km SW
43	15044	Russia, Altaiskiy krai, Kamenskiy raion, near Borovoe
44	18321	Russia, Kurganskaya oblast, Vvedenskiy raion, near Nov. Zavorina, Medvezhye lake
45	15037	Russia, Altaiskiy krai, Kosikhinskiy raion, near Zhilino, 15 km SW
46	18303	Russia, Tyumenskaya oblast, Ishimskiy raion, near Abatskoye
48	15213	Russia, Altai Republic, Kosh-Agachskiy raion, near Kurai, 12 km S
49	17726	Mongolia, Uvs aimak, Ulangom somon, near Ulangom, 25 km W, the Kharhira Mts
50	15221	Russia, Altai Republic, Kosh-Agachskiy raion, near Kurai, 9 km NW, the Kuraiski ridge
51	15252	Russia, Altai Republic, Kosh-Agachskiy raion, near Kokorya, 15 km E, the Talduair mountain
52	15254	Russia, Altai Republic, Kosh-Agachskiy raion, near Kokorya, 15 km E, the Talduair mountain
53	17741	Mongolia, Uvs aimak, Sagyl somon, near Ureg-Nur lake
54	15230	Russia, Altai Republic, Kosh-Agachskiy raion, near Kurai, 9 km NW, the Kuraiskiy ridge
55	15236	Russia, Altai Republic, Kosh-Agachskiy raion, near Chagan-Uzun, 6 km W, Kuraiskiy ridge
56	15240	Russia, Altai Republic, Kosh-Agachskiy raion, near Chagan-Uzun, 6 km NWW, the Kuraiskiy ridge
57	17615	Mongolia, Central aimak, Mongun-Mort somon, near the Kerulen river basin
58	17679	Mongolia, Ara-Khangaiskiy aimak, Taryat somon, the Hait-Terhin-Gol river basin, middle part
59	17690	Mongolia, Zavhan-aimak, near Toson-Tsengel, Turgenam
60	17715	Mongolia, the Tarbagatai ridge, the Sant river valley
61	18392	Russia, Tchelyabinskaya oblast, Tchebarkulskiy raion, near Kundravy
62	15452	Russia, Altai Republic, Shebalinskiy raion, near Cheposh, 4 km S
63	15459	Russia, Altai Republic, Shebalinskiy raion, near Chemal, 12 km S
64	15817	Russia, Krasnoyarskiy krai, Ermakovskiy raion, the Us river basin
65	15808	Russia, Khakassia, Beiskiy raion, near Sabinka, 7km S
66	16056	Russia, Altai Republic, Ust-Kanskiy raion, near Yabogan, 6 km NNW
67	16795	Russia, Altai Republic, Ulaganskiy raion, near Chodro 4 km E
68	17102	Russia, Khakassia, Ordzhonikidzewskiy raion, near Ustinkino, 4 km W
69	18685	Russia, Krasnoyarskiy krai, near Uzhur, 26km SW
70	18691	Russia, Khakasia, Bogradskiy raion, near Karasug, 4km SSW
71	15271	Russia, Altai Republic, Kosh-Agachskiy raion, near Kurai, 9 km E
72	17253	Russia, Buryatia Republic, Kyakhtinskiy raion, near Nur-Tukhum
73	17306	Russia, Chitinskaya oblast, Uletovskiy raion, near Cheremkhovo
74	17643	Mongolia, Eastern aimak, Bayan-Ula somon, near Ereni-Mondy-Zavod, the Eren-Nuru
75	15503	Russia, Chitinskaya oblast, Akshinskiy raion, near Tohtor, 5 km S
76	15510	Russia, Chitinskaya oblast, Ononskiy raion, near Stary Durulguy, 10 km S
77	15512	Russia, Chitinskaya oblast, Ononskiy raion, near Stary Durulguy, 12 km S
78	17300	Russia, Chitinskaya oblast, Uletovskiy raion, near Cheremkhovo
79	17280	Russia, Chitinskaya oblast, Krasno-Chikoiskiy raion, near Shegoldzhin
80	15535	Russia, Chitinskaya oblast, Akshinskiy raion, near Tohtor, 3 km NW
81	15538	Russia, Chitinskaya oblast, Akshinskiy raion, near Aksha, 5 km E
82	17215	Russia, Chitinskaya oblast, Khilokskiy raion, near Khokhotui
83	17273	Russia, Chitinskaya oblast, Krasno-Chikoiskiy raion, near Uruluk
84	17293	Russia, Chitinskaya oblast, Uletovskiy raion, near Ablatukan
85	18377	Russia, Tchelyabinskaya oblast, Chebarkulskiy raion, near Kundravy
86	16504	Russia, Bashkiriya, the South Urals, western part
87	16524	Russia, Bashkiriya, the South Urals, western part
88	18413	Russia, Bashkiriya, the South Urals, western part
89	18740	Russia, Bashkiriya, the South Urals, the Yuzhny Kraka ridge, the western part of Bashkirian Nature Reserve
90	18751	Russia, Bashkiriya, Zilairsky raion, the Zilairskiy Plateu
91	18794	Russia, Bashkiriya, eastern foothills of the South Ural

Oblast, raion – administrative regions of Russia and Kazakhstan; aimak and somon – administrative regions of Mongolia.
Authors of the relevés: Dymina G. (13, 35), Korotkov I. (16, 24, 49, 57, 58, 59, 74), Kuminova A. (36), Lapshina E. (17, 19), Lashchinsky N. (21), Makunina N. (12, 14, 69, 70), Maskayev Yu. (35), Pacyna A. (60), Vodopyanova N. (37), Fyodorov N. (86-88), Solomeshch A. (90, 91), Martynenko V. (89). Other relevés were performed by N. Ermakov.

REFERENCES

AHTI T., HÄMET-AHTI L., JALAS J., 1968 - *Vegetation zones and their sections in North-Western Europe.* Ann. Bot. Fenn., 5: 169-211.

ANENKHONOV O.A., CHYTRÝ M., 1988 - *Syntaxonomy of vegetation of the Svyatoj Nos Peninsula, Lake Baikal 2. Forests and krummholz in comparison with other regions of northern Buryatia.* Folia Geobotanica, 33: 31-75.

BANNIKOVA I.A., 1983 - *The vegetation. Structure of the altitudional zonation.* In: BANNIKOVA I.A., BERESNEVA I.A., BUYEVICH Z.G., GUGALINSKAYA L.A., GURICHEVA N.P., DEVYATKIN E.B., DMITRIYEV P.P., IZMAILOVA N.N., MAXIMOVICH S.V., TIMOFEEV D.A., CHIGIR V.G., SHVETSOV YU. G., BAYASTALAN L., CHOIZHAMTS B., Gornaya lesostep Vostochnogo Khangaya (MNR), Prirodniye usloviya (Somon Tevsrulkh). Biol. Res. Prir. Usl. MNR., XIX: 89-130 (russ.).

BARKMAN J.J., MORAVEC J., RAUSCHERT S., 1986 - *Code of phytosociological nomenclature. Ed. 2.* Vegetatio, 67: 145-195.

BELGARD A.L., 1950 - *The forest vegetation of South-West UkrSSR.* Izd. Kharkovskogo Universiteta. Kharkov: 422 s. (russ.).

BELOVA V.A., 1985 - *Vegetation and climate of the Late Cenozoic Era in south of Eastern Siberia.* Nauka, Novosibirsk: 160s. (russ.).

BESKRESTNOVA G.A., 1955 - *The vegetation of "island bory" in West Siberia.* In: Trudy po lesnomy khozaystvu. Vypusk 2, Novosibirsk: 151-154 (russ.)

BOX E.O., 1981 - *Macroclimate and Plant Forms: An Introduction to Predictive Modeling in Phytogeography.* The Hague: Dr W. Junk Publishers.

BOYARSKAYA T.D., MALEEVA E.A., 1967 - *Development of vegetation of Siberia and the Far East in the Quaternary Period.* Nauka, Moskva: 201s. (russ.).

BUDNIKOVA G.P., 1978 - *Phytocoenotic characterization of pine forests of the Kuznetskaya mountain basin.* In: KUMINOVA A.V. (ed.), Geobotanicheskiye issledovaniya Zapadnoi i Srednei Sibiri. Nauka, Novosibirsk: 93-108 (russ.).

BUKS I.I., BAIBORODIN V.N., TIRIMBAEVA L.S., 1977 - *Correlative ecological-phytocoenotic map of Asian Russia of 1 : 7,500,000 scale.* Institut Geographii Sibiri, Irkutsk (russ.).

BUTORINA T.N., 1963 - *Ecological-coenotic analysis of the dwarf shrub-grass layer of forest associations.* In: SMAGIN V.N. (ed.), Tipy lesov Sibiri. Izd. AN SSSR, Moskva: 30-51 (russ.).

CHEREPANOV S.K., 1995 - *Vascular plants of Russia and neighbor countries.* Izd. Mir i Semya, Saint-Petersburg: 990s. (russ.).

DIEKMANN M., 1994 - *Deciduous forest vegetation in Boreo-nemoral Scandinavia.* Acta Phytogeogr. Suec., 80: 1-112.

DUGARZHAV C. KOROTKOV I.A., SAVIN E.N., SEMECHKIN I.V., TETENKIN A.E., YANOVSKY V.M., 1975 - *Forests of Tarbagatai mountain ridge in Mongolia.* Lesovedeniey, 2: 38-46 (russ.).

DYMINA G.D., 1989 - *Materials for floristic classification in Western Sibiria (The Ob River right bank of Novosibirskaya oblast).* Ms. (Dep. VINITI. N2002-V89), Moskva: 68s. (russ.).

ELLENBERG H., 1986 - *Vegetation Ecology of Central Europe.* Cambridge University Press. Cambridge, New York, New Rochlle, Melbourne, Sydney.

ERMAKOV N.B., 1987 - *Characterization of pine forests of the Northern Altai.* In: KUMINOVA A.V. (ed.), Geobotanicheskiye issledovaniya Zapadnoi i Srednei Sibiri. Nauka, Novosibirsk: 84-92 (russ.).

ERMAKOV N.B., 1994 - *To the problem of position of mesophilous grass forests of the Southern Ural, south-eastern part of the West Siberian Plain and Eastern Kazakhstan in Braun-Blanquet system.* Ms. (Dep. VINITI. N 292 - V94), Moskva: 35s.(russ.).

ERMAKOV N., 1995a - *Grass forests classification of Southern Siberia and Mongolia.* Colloques Phytosociologiques, XXIII: 259-276.

ERMAKOV N.B., 1995b - *Classification of Siberian montane sub-nemoral small-leaved/dark coniferous and lime forests.* In: KUPRIYANOV A.N. (ed.), Botanicheskiye issledovaniya Sibiri i Kazakhstana. Sbornik nauchnykh statey Gerbaria Altaiskogo Universiteta. Izd. Altaiskogo Universiteta, Barnaul: 30-91 (russ.).

ERMAKOV N.B., 1996a - *Syntaxonomical peculiarities of xero-mesophilous birch forests of the southern part of the Priobskoye Plateau (in the Altai region).* In: Flora i rastitelnost Altaya. Trudy Yuzhno-Sibirskogo botanicheskogo sada. Izv. Altaiskogo Universiteta, Barnaul: 170-174 (russ.).

ERMAKOV N.B., 1996b - *Botanical-geographical peculiarities of the formation of xerophilous larch forests flora on southern macroslope of the Khorumnug-Taiga ridge (the western part of the Sangilen Plateau).* In: Global monitoring and Uvs-Nuur Basin". Reports of IV International Symposium on Resuls of International Biosphere Monitoring Scientific Programm "Experiment Uvs-Nuur". Intellect., Moscow: 34-41.

ERMAKOV N.B., 1997 - *The birch (Betula davurica) forests - element of Manchurian forest-steppe in the vegetation of Siberia.* Siberian Journal of Ecology, 1: 59-69.

ERMAKOV N., 1998 - *The Altaian relict subnemoral forest belt and the vegetation of pre-Pleistocene mountainous landscapes.* Phytocoenologia, 28 (1): 31-44.

ERMAKOV N. 1999a - *Postglacial cryo-xerophilous larch forests of South Siberia and Mongolia.* Colloques Phytosociologiques. (in press.).

ERMAKOV N.B., 1999b - *Syntaxonomical and plant-geographical peculiarities of xero-philous psammophilous pine forests of the West Siberian Plain.* In: Flora i rastitelnost Altaya. Trudy Yuzhno-Sibirskogo botanicheskogo sada, T. 4., Vypusk 1. Izd. Altaiskogo Universiteta, Barnaul: 53-62 (russ.).

ERMAKOV N.B., KOROLYUK A.Yu., LASHCHINSKY N.N., 1991 - *The floristic classification of mesophilous grass forests of Southern Siberia.* SO AN SSSR, Novosibirsk: 96s. (russ.).

ERMAKOV N.B., KOROTKOV I.A., LALETIN A.P., 1992 - *Syntaxonomical characteristic of light coniferous grass forests of the southern part of the Sayani Mts and Mongolia.* Ms. (Dep. VINITI. N 1955-V92), Moskva: 49s. (russ.).

ERMAKOV N.B., MAKUNINA N.I., MALTSEVA T.V., 1997 - *Syntaxonomical characterisation of four associations of birch and birch-pine grass forests of the forest-steppe of the Ob, Tom river basins.* Ms. (Dep. VINITI. N 1890-V97), Moskva: 46s. (russ.).

FALINSKI J.B., 1990 - *Scientific Report. IV. Review of forest communities.* In: FALINSKI J.B., PEDROTTI F. (eds.), Southwestern Siberian taiga project. Pichtovka 1989, 1990. Report of geobotanical research". Pytocoenosis, 2 (N.S.) Archivum Geobotanicum, 1: 15-28.

FALINSKI J.B., ADAMOWSKI W., LAPSINA E., LUCZAJ L., VENANZONI R., 1995a (1991) - *Vegetation of the Kudrjašovskij Bor.* In: FALINSKI J.B., PEDROTTI F. (eds.), Southwestern Siberian Taiga Project. Report of geobotanical researches 2. Phytocoenosis, 3 (N.S.), Archivum Geobotanicum, 2: 19-24.

FALINSKI J.B., VENANZONI R., PAWLACZYK P., KUJAWA-PAWLACZYK J., ZVEREV A., ADAMOWSKI W., - 1995b (1991) - *Forest communities on the permanent*

plots in the Pichtovka study area. In: FALINSKI J.B., PEDROTTI F. (eds.), Southwestern Siberian Taiga Project. Report of geobotanical researches 2. Phytocoenosis, 3 (N.S.), Archivum Geobotanicum, 2: 79-83.

Flora of Siberia (1988-1998), Vol. 1-13. Nauka, Novosibirsk (russ.).

Flora of the USSR (1934-1964), Vol. 1 - 30. Leningrad-Moskva (russ.).

FYODOROV N.I., 1991 - *Syntaxonomy of pine-birch forests of the Southern Ural.* Ms. (Dep. VINITI. N 255-V91), Moskva: 36s. (russ.).

FYODOROVA I.T., 1980 - *East European forest-steppe and steppe pine forests.* In: GRIBOVA S.A., ISACHENKO T.I., LAVRENKO E.M. (eds.), Rastitelnost Evropeiskoy chasti SSSR. Nauka, Leningrad: 133-135 (russ.).

GORODKOV B.N., 1915 - *The small-leaved forests subzone of Ishim Uyezd of Tobol Gubernya.* In: Fedchenko B.A. (ed.), Trudy pochvenno-botanicheskikh expeditsii po issledovaniyu kolonizatsionnykh raionov Aziatskoi Rossii, Tchast II, Vypusk 3. Bot. issled. Petrograd: 200s. (russ.).

GRIBOVA S.A., ISATCHENKO T.I., 1979 - *Pine forests of European part of the USSR: geography and cartography.* Geobotanitcheskoye kartographirovaniye: 38-46 (russ.).

GUMAROVA R.R., 1993 - *Syntaxonomy of the korian pine - broad-leaved mountain forests of the Southern Sykhote-Alin.* Ms. (Dep. VINITI, N 502-V93), Moskva: 61s. (russ.).

HÄMET-AHTI L., 1981 - *The boreal zone and its biotic subdivision.* Fennia, 159 (1): 69-75.

HENNEKENS S.M., 1996 - *TURBO(VEG). Software package for input, processing, and presentation of phytosociological data. User's guide.* IBN-DLO, University of Lancaster, Lancaster: 59 pp.

HILBIG W., 1990 - *Pflanzengesellschaften der Mongolei.* Wiss. Z. Univ. Halle 1990/39, (P 44. Halle): 1-146.

HILBIG W., 1996 - *The plant communities of Mongolia.* In: HILBIG W., The vegetation of Mongolia. SPB Academic Publishing, Amsterdam: 34-233.

HILBIG W., KNAPP H., 1983 - *Vegetationsmosaik und Florenelemente an der Wald - Steppen - Granze im Chentej-Gebirge (Mongolei).* Flora, 174: 1-89.

HILL M.O., 1979 - *DECORANA and TWINSPAN, for ordination and classification of multivariate species data: a new edition, together with supporting programs, in FORTRAN 77.* Institute of Terrestrial Ecology, Huntingdon: 58 pp.

IGNATOV M.S., AFONINA O.M., (eds.) 1992 - *Check-list of mosses of the former USSR.* Arctoa, 1 (1-2). Delphes Ltd.: 1-85.

ILYINA O.S., DENISOVA A.V., MIRKIN B.M., 1988 - *Syntaxonomy of vegetation of the Lower Ob and Irtysh Rivers valleys. I. General syntaxonomical description. Cl. Salicetea purpurea Moor 1958 and cl. Querco-Fagetea Br.-Bl. et Vlieger in Vlieger 1937.* Ms. (Dep. VINITI. N6916-V88), Moskva: 36s. (russ.).

KAMELIN R.V., 1998 - *Materials on history of flora of Asia. (Altai mountain system).* Izv. Altaiskogo Universiteta, Barnaul: 240s. (russ.).

KAMENETSKAYA I.V., MIKHAILENKO M.M., SAVIN E.N., 1963 - *Pine forests of South-Western Priangarye.* In: SMAGIN V.N. (ed.), Tipy lesov Sibiri. Izv. AN SSSR, Moskva: 52-107 (russ).

KHARKEVICH S.S., (Ed.), 1985-1996 - *The vascular plants of the Soviet Far East.* Vol. 1-8. Nauka, Leningrad - Saint Petersburg (russ.).

KIELLAND-LUND J., 1981 - *Die Waldgesellschaften SO Norwegens.* Phytocoenologia, 9: 53-250.

KLEOPOV Yu.D., 1941 - *The peculiarities of genesis of flora of the broad-leaved forests of the European part of the USSR.* In: Materialy po istorii flory i rastitelnosti SSSR. T. 1, Leningrad: 183-256 (russ.).

KLEOPOV Yu.D., 1990 - *The analysis of flora of broad-leaved forests of the European part of the USSR.* Naukova Dumka, Kiev: 352s. (russ.).

KORNILOVA V.S., 1966 - *Essay of the flora and vegetation history of Kazakhstan.* In: Rastitelny pokrov Kazakhstana. T. I, Alma-Ata: 37-190 (russ.).

KOROLYUK A.Yu., 1993 - *Syntaxonomy of the vegetation of the southern part of West Siberia. 2. Meadows, steppes and forests.* Ms. (Dep. VINITI. N 1578-V93), Moskva: 49 s. (russ.).

KOROLYUK A.Yu., KIPRIYANOVA L.M., 1998 - *The prodromus of natural vegetation of the south-eastern part of West Siberia (Altai region and Novosibirskaya oblast).* In: KUPRIYANOV A.N. (ed.), Botanicheskiye issledovaniya Sibiri i Kazakhstana. Vypusk 4, Izd. Altaiskogo Universiteta, Barnaul: 63-82 (russ.).

KOROTKOV I.A., 1978 - *Forests types of Mongolian People's Republic.* Nauka, Moskva: 47-121 (russ.).

KOROTKOV K.O., 1991 - *Valday Forests.* Nauka, Moskva: 160s. (russ.).

KOROTKOV K., ERMAKOV N., 1999 - *Waldpflanzensoziologie im Bereich der ehemaligen UdSSR: geschichte, aktueller stand und prognose.* Phytocoenosis, 11(N.S.), Supplementum Cartographiae Geobotanicae, 11: 103-122.

KRASHENINNIKOV I.M., 1937 - *Analysis of relic flora of the South Urals in relation with history of vegetation and paleogeography of Pleistocene.* Sovet. Botanika, 4: 16-45 (russ.).

KRYLOV A.G., 1963 - *Siberian pine forests types of the North-Eastern Altai.* In: SMAGIN V.N. (ed.), Tipy lesov Sibiri. Izv. AN SSSR, Moskva: 141-160 (russ.).

KRYLOV A.G., 1984 - *The life forms of the forest phytocoenoses.* Nauka. Leningrad: 181s. (russ.).

KRYLOV A.G., RECHAN S.P., 1967 - *Cedar pine and larch forest types of Altai.* Nauka. Moskva: 223s. (russ.).

KRYLOV G.V., 1961 - *Forests of West Siberia.* Moskva: 256s. (russ.).

KUMINOVA A.V., 1960 - *The vegetation of the Altai.* Nauka, Novosibirsk: 450s. (russ.).

KURENTSOVA G.E., 1967 - *Essay of vegetation of Jew Autonomous Oblast.* Vladivostok: 63s. (russ.).

KURENTSOVA G.E., 1973 - *Natural and anthropogenic changes in the vegetation of Primorye and the South Amur Region.* Nauka, Novosibirsk: 230s. (russ.).

LAPSHINA E.I., 1985 - *Pine forests of subtaiga and forest-steppe, and secondary communities.* In: ILYINA I.S., LAPSHINA E.I., LAVRENKO N.N. *et al.*, Rastitelny pokrov Zapadno-Sibirskoy ravniny. Nauka, Novosibirsk: 120-124 (russ.).

LASHCHINSKY N.N., 1981 - *Structure and dynamics of pine forests of Nizhneye Priangarye.* Nauka, Novosibirsk: 270s. (russ.).

LASHCHINSKY N.N., REVYAKINA M.P., 1991 - *Ecological-floristical classification of the shrub communities of Caragana arborescens in the Salair.* Ms. (Dep. VINITI N 1349-V91), Moskva: 27s. (russ.).

LASHCHINSKY N.N., LUZANOV V.G., REVJAKINA M.P., LASHCHINSKY N.N.(j.), MAHATKOV N.D., CHERYOMUSHKINA V.A., 1991 - *Ecology of the Salair chern forest communities.* Nauka, Novosibirsk (russ.).

LAVRENKO E.M., 1973 - *The boreal vegetation of the Liman group of lakes and bogs in the valley of Middle Donets.* In: DYLIS N.V., ZALENSKY O.V. *et al.*, Problemy biocenologii, geobotaniki i botanicheskoy geographii. Nauka, Leningrad: 125-155 (russ.).

LAVRENKO E.M., KOROTKOV I.A., TSEDENDASH C., 1983 - *Map of the forests of Mongolian People's Republic. Scale 1:1500000.* GUGK, Moskva (russ.).

LAVRENKO N.N., 1985 - *Birch and Pine*

forests. In: ILYINA I.S., LAPSHINA E.I., LAVRENKO N.N. *et al.*, Rastitelny pokrov Zapadno-Sibirskoy Ravniny". Nauka, Novosibirsk: 125-137 (russ.).

LIPATOVA V.V., 1969 - *Plant associations in the subzone of broad-leaved - coniferous forests (illustrated by the analysis of model plots)*. In: YUNATOV E.D. (ed.), Amurskaya taiga. Nauka, Leningrad: 53-89 (russ.).

MALYSHEV L.I., PESHKOVA G.A., 1984 - *Peculiarities and genesis of flora of Siberia (Predbaikalye and Zabaikalye)*. Nauka, Novosibirsk: 265s. (russ.).

MARTYANOV V.A., 1989 - *The role of palynology for the development of stratigraphy of the Palaeogen and Neogen deposits of West Siberia.* In: The Cenozoic Era in Siberia and north-west of the USSR. Nauka, Novosibirsk: 31-36 (russ.).

MASKAYEV Yu. M., 1985 - *Forets*. In: KOROPACHINSKY I.Yu. (ed.), Rastitelny pokrov i yestestvenniye kormoviye ugodya Tuvinskoy ASSR. Nauka, Novosibirsk: 68-106 (russ.).

MEUSEL H., JÄGER E., WEINERT E., 1965 - *Vergleichende Chorologie der Zentraleuropaischen Flora.* 1., Jena: 258 pp.

MEUSEL H., JÄGER E., RAUSCHERT S., WEINERT E. 1978 - *Vergleichende Chorologie der Zentraleuropaischen Flora. Karten. Band II.* Jena: 259-421.

MIRKIN B.M., KASHAPOV R.Sh., ALIMBEKOVA L.M., 1988 - *Part 1. Geobotanical and economical characterization of hay-fields and pastures of "Tevshrulekh" state farm.* In: Phytocenoticheskiye osnovy uluchsheniya estesstvennykh kormovykh ugodiy MNR. Biol. Res. i prir. Usl. Mongolskoi Narodnoi Respubliki, XXXI (7). Nauka, Moskva: 1-44 (russ.).

MIRKIN B.M., SOLOMESHCH A.I., ISHBIRDIN A.R., ALIMBEKOVA L.M., 1989 - *List and diagnostic criteria of the high-rank units of floristic-ecological classification of vegetation of the USSR*. Inst. Evol. Morph. i Ecol. Zhivotnykh, Moskva. (russ.).

MONSERUD R., TCHEBAKOVA N., LEEMANS R., 1993 - *Global vegetation change predicted by the modified Budyko model.* In: Climatic Change 25. Kluwer Academic Publishers, Netherlands: 59-83.

MUCINA L., 1997 - *Conspectus of Classes of European Vegetation*. Folia Geobot. Phytotax., 32: 117-172.

MUCINA L., RODWELL J.S., SCHAMINÉE J.H.J., DIERSCHKE H., 1993 - *European Vegetation Survey: current state of some national programmes*. J. Veget. Sci., 4(3): 429-438.

NAZIMOVA D., POLIKARPOV N., 1996 - *Forest zones of Siberia as determined by climatic zones and their possible transformation trends under global change*. Silva Fennica, 30 (2-3): 201-208.

NIKITIN V.P., 1989 - *Oligocene floras of West Siberia*. In: ZYKINA V.S. (ed.), The Cenozoic Era in Siberia and north-west of the USSR. Nauka, Novosibirsk: 26-31 (russ.).

NOVOSELTSEVA I.F., 1969 - *Types of light-coniferous forests of Selenga Dauria*. In: SMAGIN V.N. (ed.), Tipy lesov Sibiri. Vypusk 2, Krasnoyarsk: 182-215 (russ.).

OBERDORFER E., 1992 - *Süddeutsche Planzengellschaften*. Teil IV, 2, Auflage, B. Tabellenband. G. Fischer., Jena, Stuttgart, New York.

PACINA A., (1984)1986 - *Vegetation of the Sant Valley in the Khangai Mountains (Mongolia)*. Fragmenta Floristica et Geobotanica, XXX, 4: 313-451. Warszawa-Krakov.

PANARIN I.I., 1966 - *Forests of the Central Zabaikalye*. Chita: 321s. (russ.).

PESHKOVA G.A., 1958 - *Materials on the vegetation of Priargunye*. In: REYMERS F.E., NOMOKONOV L.N. (eds.), Botanika, 7, Ser. Biol. Blagoveshchensk: 75-88 (russ.).

PESHKOVA G.A., 1964 - *Pine forests of the southern part of Bratski region*. In: GOLUBEV V.V. (ed.), Rastitelnost raionov pervoocherednogo osvoyeniya Taishet-Bratskogo promyshlennogo komplexa. Irkutsk: 35-51 (russ.).

PESHKOVA G. A., 1972 - *Steppe flora of Baikal Siberia*. Nauka, Moskva: 207s. (russ.).

POBEDINSKY A.V., 1965 - *Pine forests of the Middle Siberia and Zabaikalye*. Nauka, Moskva: 268s. (russ.).

POPOV L.V., 1961 - *Forest group of watershed between the Chuna and Vikhorevaya rivers*. In: POPOV L.V. (ed.), Trudy Vostochno-Sibirskogo filiala SO AN SSSR. Lesovedeniye, 37, Ser. Biol. Irkutsk: 3-12 (russ.).

POPOV M.G., 1949 - *Essay of the vegetation and flora of the Karpaty*. Moskva: 303s. (russ.).

POVARNITSYN N.A., 1931 - *Forests and forests regeneration in the Belaya river basin in the Eastern Sayani*. In: SUKACHYOV V.N. (ed.), Angarskaya expeditsiya 1931g. Seria Sibirskaya, 7 (2). Izd. AN SSSR, Leningrad: 5-221 (russ.).

PRENTICE I., CRAMER W., HARRISSON S., LEEMANS R., MONSERUD R., SOLOMON A., 1992 - *Global biome model predicting global vegetation patterns from plant physiology and dominance, soil properties and climate*. Biogegr., 19: 117-134.

RECHAN S.P., KRYLOV A.G., 1963 - *Short description of forests of the right bank of middle part of the Katun river basin*. In: SMAGIN V.N. (ed.), Tipy lesov Sibiri. Izd. AN SSSR, Moskva: 171-181 (russ.).

RODWELL J.S., 1995 - *The European Vegetation Survey questionnaire: an overview of phytosociological data, vegetation survey programmes and database in Europe*. Annali di Botanica, LIII: 87-98.

RYSIN L.P., 1962 - *The forests of the Kizhinga river basin (Buryat ASSR)*. In: ZHUKOV A.B., PRAVDIN L.F. (eds.), Lesa i lesnoye khozyaistvo Buryatskoy ASSR. Trudy Instituta Lesa i drevesiny LIV. Izd. AN SSSR, Moskva: 119-157 (russ.).

RYSIN L.P., 1975 - *Pine forests of the European part of the USSR*. Nauka, Moskva: 212s. (russ.).

SAVINA L.N., KOROTKOV I.A., OGORODNIKOV A.V., SAVIN E.N., BURENINA T.A., 1981 - *Tendencies of development of forests of Mongolian People Republic (data on spore-pollen analysis of forest soils)*. In: SAVINA L.N. (ed.), Palaeobotanichskiye issledovaniya v lesakh Severnoy Azii. Nauka, Novosibirsk: 83-157 (russ.).

SCHUBERT R., JÄGER E., MAHN E. G., 1979 - *Vergleichende geobotanische Untersuchungen in der Baschkirischen ASSR. 1 Teil: Walder*. Hercyna, 16: 206-263.

SEMENOVA-TYAN-SHANSKAYA A.M., 1957 - *The materials on distribution of the pine forests of Privolzhye*. In: Geobotanika XI. Izd. AN SSSR, Leningrad: 309-338 (russ.).

SOCHAVA V.B., 1979 - *The vegetation in thematic maps*. Nauka, Novosibirsk: 190s. (russ.).

SOLOMESHCH A.I., GRIGORYEV I.N., KHAZIAKHMETOV R.M., BAISHEVA, E.E., 1993 - *The forest syntaxonomy of the Southern Ural. V. Coniferous-broad-leaved forests*. Ms. (Dep. VINITI. N1464-V93), Moskva: 68s. (russ.).

TARAN G.S., 1993 - *Syntaxonomical syrvey of shrub vegetation of the Middle Ob' flood-plain (Alexandrovskoye piece)*. Siberian Journal of Biology, 6: 79-84.

TCHEBAKOVA N.M, MONSERUD R.A., NAZIMOVA D.I., 1994 - *A Siberian vegetation model besed on climatic parameters*. Can. J. For. Res., 24: 1597-1607

TYULINA L.N., 1976 - *Humid Baikal type of altitudional vegetation pattern*. Nauka, Novosibirsk: 319s. (russ.).

VASILYEV Ya.Ya., 1931 - *Forests and forest recovery in the regions of Bratsk, Ilimsk and Ust-Kut*. In: SUKACHYOV V.N.

(ed.), Angarskaya lesnaya expedicia 1931, 2. Izd. AN SSSR, Leningrad: 5-111 (russ.).

VERKHOLAT V.P., KRYLOV A.G., 1982 - *Analysis of vascular plant flora of oak forests of the South Sihote-Alin.* In: Komarov Mem. Conf. XXIX: 3–22. Vladivostok (russ.).

VODOPYANOVA N.S., 1964 - *Typological characterization of forests of the Taishetsky region.* In: GOLUBEV V.N. (ed.), Rastitelnost raionov pervoocherednogo osvoyeniya Taishet-Bratskogo promyshlennogo kompleksa. Vost. Sib. Knizhnoye Izd. Irkutsk: 3-34.

VOLKOVA V.S., 1977 - *Stratigraphy and history of formation of vegetation of West Siberia in the Late Cenozoic Era.* Nauka, Moskva: 240s. (russ.).

VOLKOVA V.S., PANOVA L.A., 1975 - *Palinological characteristic of the Neogen deposits of the West Sibirian Plain.* In: Palynologia Kainozoya v Sibiri. Nauka, Novosibirsk: 34-54 (russ.).

WESTHOFF V., VAN DER MAAREL E., 1973 - *The Braun-Blanquet approach.* Handb. Veg. Sci., 5: 617-726.

YUNATOV A.A., 1954 - *Fodder plants of the pasture and hay meadows in the Mongolian People's Republic.* Acad. Nauk SSSR, Moskva-Leningrad: 352s. (russ.).

ZHITLUKHINA T.I., 1988 - *Syntaxonomy of forests and subalpine meadows of the Kyginsky ecological transect (the southern part of Teletskoye Lake).* Ms. (Dep. VINITI. N N2146-V88), Moskva: 45s. (russ.).

ZHITLUKHINA T.I., MIRKIN B.M., 1987 - *Syntaxonomy of vegetation in the Sayano-Shushenskiy Nature Reserve. I. Physic-geographical conditions and cl. Irido-Laricetea cl. nova.* Ms. (Dep. VINITI, N 3357-V87), Moskva: 42s. (russ.).

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