VEGETATION OF THE TISZA INUNDATION AREA IV. EXAMINATION RESULTS OF THE *MAGNOCARICION* ASSOCIATIONS FROM THE AREA OF ALPÁR

GY. BODROGKÖZY

Botanical Institute of the Attila József University
(Received March 14, 1967)

The high *Cyperaceae* associations of the inundation area of Tisza show a particular characteristic known, as far, but little in its details. The reed-grass vegetation of the Tisza inundation area, limited between dams, grows more and more poor and monotonous as a consequence of the young inundation soils and the increasing effect of culture. That picture is reflected also in the literature on the subject (Timár 1952, 1953, 1954; Timár—Bodrogközy 1959; Bodrogközy 1962).

The ancient *Magnocaricion elatae* associations of our river to-day belong, for the most part, already to the past. They can, anyhow, still be found in some sectors with more favourable ecologic conditions. The inundation areas in the neighbourhood of the villages Tiszaug and Alpár are like these, belonging to the most extensive such areas along the Tisza (Fig. 1). Their vegetation is extremely various, due to the older and younger backwater systems running through the areas. At present we want to deal only with the analysis of the *Magnocaricion elatae* association from these.

Another odd thing about the area, having an extremely great influence on its ecologic conditions, is that the here dominating north-western winds have removed the sand of the Great Hungarian Plain between the Danube and Tisza till the line of the Tisza east of Kiskunfélegyháza, massing it up close to the western limits of the inundation area Tiszaug—Alpár—Tiszaújfalu. The precipitation waters, seeping through this territory of sand-hills or water-loess hills and getting to a water-closing stratum-line, ensure a continuous water-supply of the western sector of the inundation area. As a result of that, the marsh-lands, whose vegetation is unique in the whole Tisza valley, have developed. The continuous water supply of these marsh-lands from the direction of the loess range and sand area is proved also by the standing functioning of the stratum source of Tőserdő.

The favourable microclimatic conditions, as well, have contributed to the development of a marsh vegetation. The sand-hills, lining the

inundation area, from a defensive wall partly with acacias, partly with orchards; and the cool, humid environment — similarly to other lowland marsh-lands, e.g., Bátorliget — ensure the survival of some rare species (S o ó 1953).

The species combinations found here resist even the effect of the 2—3 m high water of the periodic inundations.

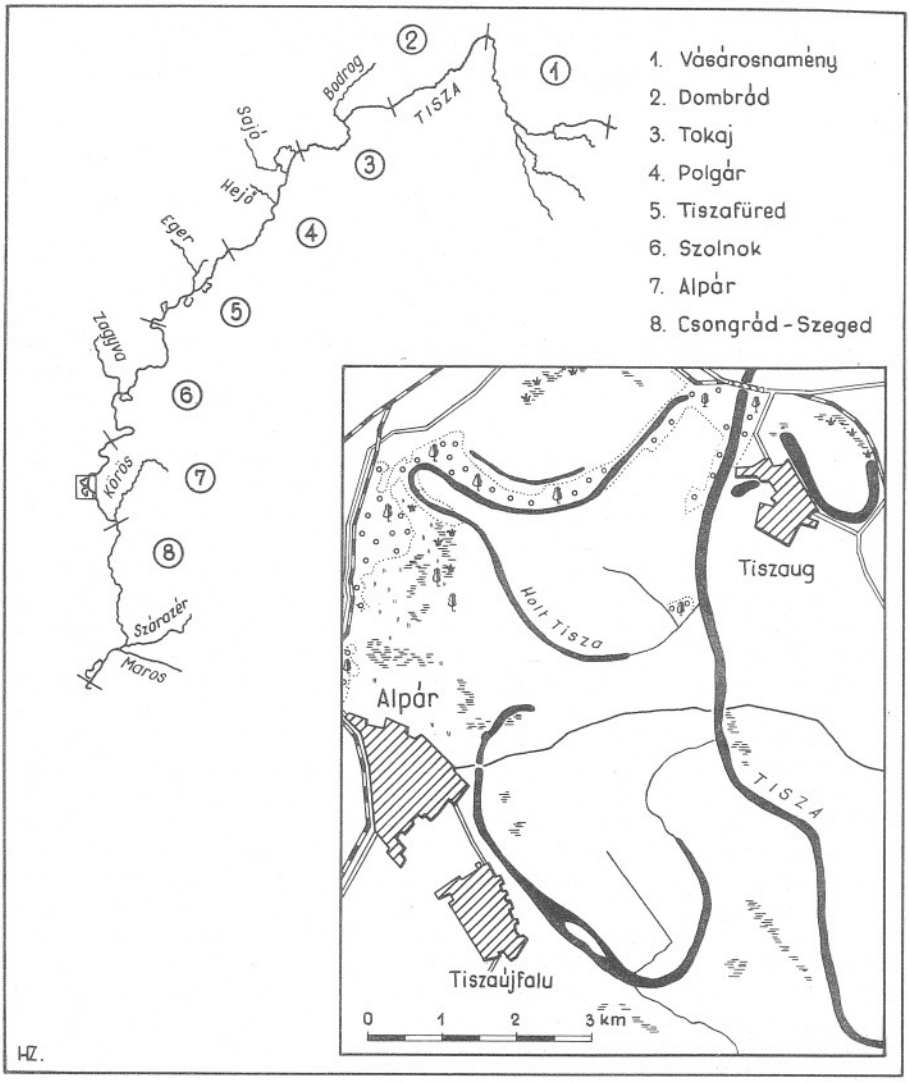


Fig. 1. The examined parts of the Tisza inundation area, with a map of the part examined at present.

Their soil has originated — in contrast to the new soils of the inundation area being in the initial stage of their development — from the alluvial deposit of the old river-meanders, of marsh-lands with reed- and bulrush-peat of 30—90 cm thickness. This peat is suitable to be exploited, as well; in the last years its trial exploitation began, in fact, becoming a danger for the existence of the old marsh vegetation.

That danger made us elaborate the area in details and publish our results before the ancient vegetation will have fallen a victim to culture.

Material and method

In 1953 we began elaborating the Tisza inundation area in the environs of Tőserdő—Alpár after having finished the vegetation-mapping of the part of the inundation area between Szolnok and Szeged in the framework of a co-operative (Bodrogközy—Jeanplong—Précsényi and Timár). So far this mapping material could, unfortunately, not be published, as yet; its manuscript material is, anyway, preserved in the vegetation-map collection of the Botanical Institute of the Attila József University. Since then the area has been examined systematically, the examinations including all the phytocenoses, found here, in the spring, summer and autumn aspects alike.

Besides analysing the vegetation, there have been carried out detailed soil-ecologic examinations, as well, concentrated first of all on the physical structure. The granule size of the opened soil profiles has been analysed by a hygrometric procedure thus getting two-two kinds of the sand, mud and clay fractions.

Cyperaceae vegetation of the marsh-land and its environs

In the zone of the silted backwater system of our area, lying outside of the *Potametea* and *Phragmition* zones, there have developed the *Magnocaricion elatae* associations examined by us. Their further succession — in the course of which they go over through the bush-willow plantations of *Calamagrosti-Salicetum cinereae* Soó et Zólyomi 55 at Alpár to the marsh-woods of *Thelypteridi-Alnetum* (Klika 40) Soó 57, at Tőserdő to those of *Fraxino pannonicae-Alnetum* Soó et Komlódi 60 — is at present hindered partly by the high water, partly by the survival of grass-lands as a result of anthropogenous influences.

The order of treating the single associations is chosen on the basis of their zonation.

1. (a) *Carici-Menyanthetum* (Nowinsky 28) Soó 55 *caricetosum gracilis* (Nova subass)

1. The original denomination of this association, *Menyanthetum* Nowinsky 28, may be considered synonymous; in this country it was published by Soó under a similar name in 1938.
2. It is distributed in the area of Alpár inside the examined territory, to-day already limited to a rather narrow area, and even condemned to death if the peat exploitation is continued. It follows

everywhere the line of the ancient meander of peat soil, of standing water supply and of a particular microclimate.

3. a. It is characteristic of its ecologic conditions that in its soil profile the average adobe, resp. the clayey adobe has become more

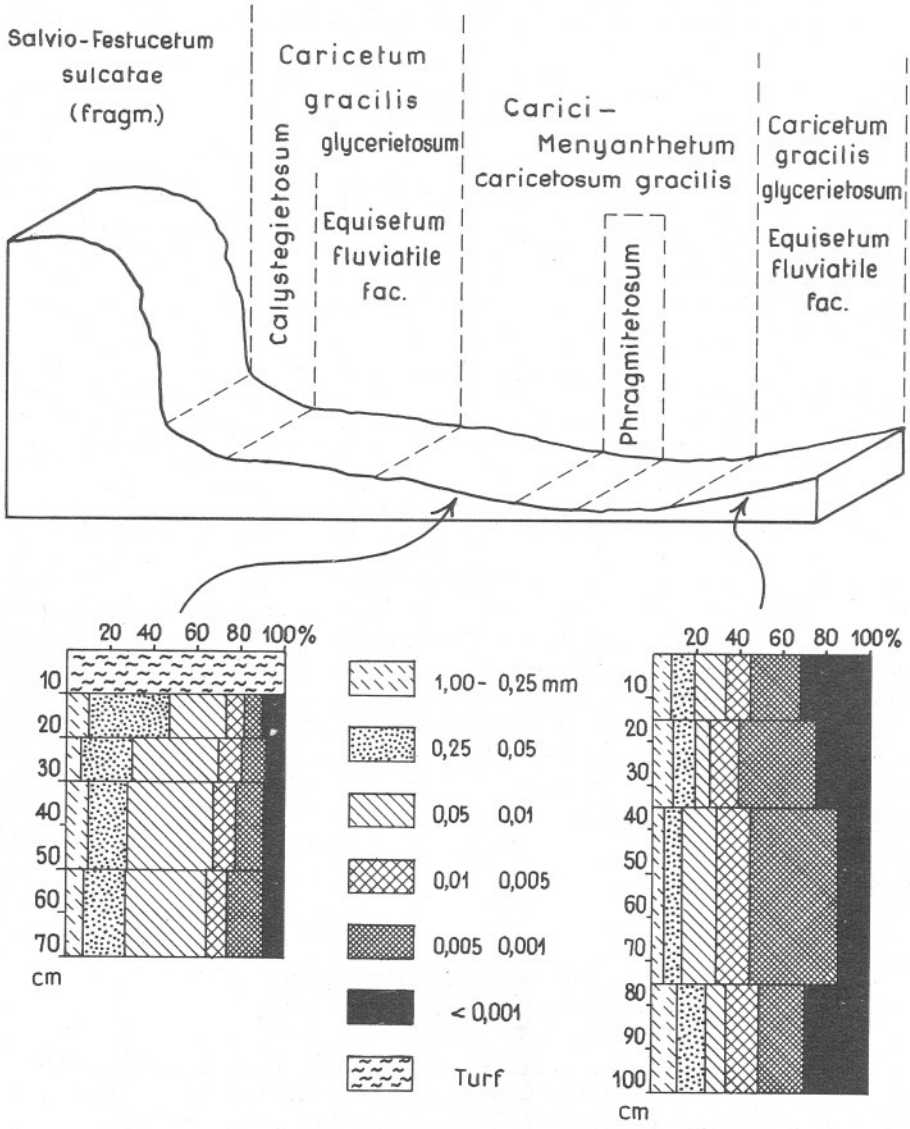


Fig. 2. Location and zonation of the *Carici-Menyanthetum* in the area of the village Alpár in the neighbourhood of a loess wall covered by *Salvio-Festucetum sucatae* fragmentum.

and more peaty towards the surface of the soil. In its soil fraction, namely, which is but scarcely boggy if we walk on it, it is already probably hindered by the fraction of bigger granule size carried in from the near-by loess, resp. sand areas (Fig. 2).

b. Its subsoil-water rises above the soil surface in the beginning of the vegetation period, and its thickness is influenced by the size of the inundation waves coming from time to time. Its water level doesn't decrease deeper than 40—50 cm even in the summer period.

4. The present species combination of its cenoses is differring in a significant degree from the species combinations of the *Carici-Menyanthetum* published from other marshy regions of the country, where subassociations are formed by the species *Carex pseudocyperus, C. elata, C. appropinquata, C. diandra, C. inflata* (S o ó 1957; 1964), being known from the central range of mountains and, apart from the marshy areas of Transdanubia, first of all from the part of the Great Hungarian Plain between the Danube and Tisza, as well from the Nyír, a destrict in North-Eastern Hungary.

In our area, namely, the differencial species is the *Carex gracilis,* a dominant sedge species in the Tisza valley. In the zone of the association the *Menyanthes trifoliata* appears everywhere with high dominance values, and even, in spots, it forms pure substances, too, being thus of facies value.

As in some cenoses also sedge species of rare occurrence like the *Carex intermedia (= C. disticha)* and the *Carex vesicaria* can be found that may probably have been repressed as a result of an increased anthropogenous influence (mowing, periodical grazing) but they used to be, supposedly, of dominant significance forming species combinations of subassociation value. Here and there the *Carex elata (= C. hudsoni)* can often be seen even to-day.

After the single species combinations having been analysed according to character-species, it can be ascertained that, inside the spreading area of the association, further minor zones, as well, can be separated. In its innermost zone, e.g., besides the dominant *Magnocaricion* elements, several species come, in a considerable coverage, from the group of *Glycerio-Sparganion,* resp. *Phragmition,* which is related to it; these are, as expected, first of all the Cosmopolitan and Circumpolar species (Fig. 3).

There is considerable also the role of the species *Agrostion, Molinion,* as well *Molinio-Juncetea,* in case of which the Eurasian-Mediterranian species, too, become conspicuous.

Going towards the rim of the spreading area of the association, from the marshy meadow species the *Lysimachia nummularia, Ranunculus repens, Potentilla anserina* reflect a decreasing water coverage and an increasing zoogene influence.

That is, however, not of so high degree that it sould result in the expansion of the weed species. Therefore, the weed species, as well the neutral species, of the inundation area play but a minor role both in point of species number and in that of covering alike (Fig. 3).

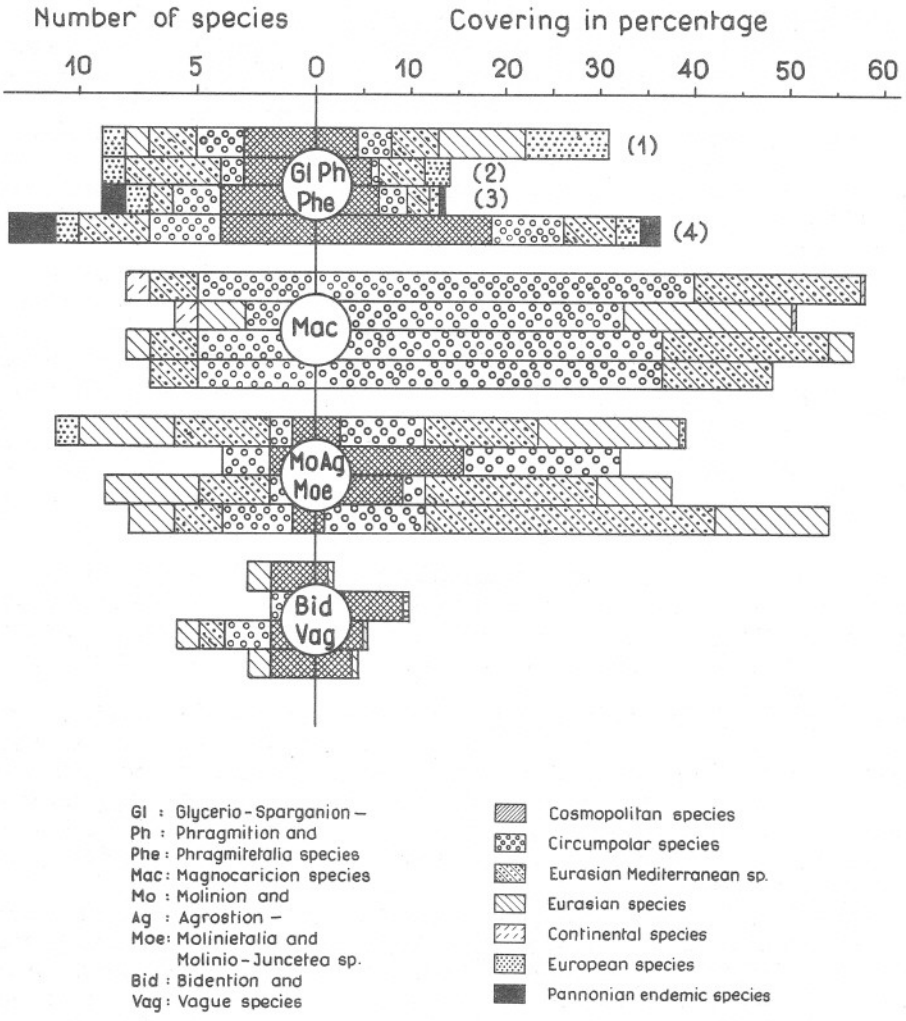


Fig. 3. Distribution of the species combinations of the *Carici-Menyanthetum caricetosum gracilis* according to the species and dominance values of the group-, series-, and clascharacter-species as well of the floral elements. (1)—(4): Numbers of data, Table I.

1. (b) Carici-Menyanthetum (Nowinsky 28) Soó 55, *phragmitetosum* Soó 57

1. The description of the subassociation, denominated *Menyanthetum phragmitetosum,* took place in 1938; later on it has occurred with an association value: *Phragmiteto-Menyanthetum* Soó 55. Both denominations may be considered synonymous.

2. Its spreading in the examined area is less considerable than that of the former subassociation; it forms smaller or larger spots in the area of the subassociation differentiated by the *Carex gracilis.*

3. We have not found, as far, such ecologic differences whose occurrence could be explained.

4. Its cenoses are dissected into two, upper and lower, levels, seperated obviously. The upper one is formed by the *Phragmites communis* and other group character-species *(Schoenoplectus lacustris Typha latifolia,* in other places *Salix cinerea)* that can be considered differential species, and the lower level by *Magnocaricion* elements. There occur in it, besides the *Carex gracilis,* the *Equisetum fluviatilis Hippuris vulgaris Lastrea thelypteris* en masse, — depending upon the degree of closing of the *Phragmites,* — and become of facies creating character.

2. *Caricetum gracilis* (Gräbner et Hueck 31) Tx 37

1. The first data of the association in this country were published under the name *Caricetum acutiformis gracilis* Soó 27, and later under that of *C. gracilis-nutantis* Soó 40, both being synonymous denominations. Its further similar names can be found in Soós's flora publication (1964).

2. In the area, examined at present, from Tiszaug till Alpár, the *Magnocaricion* is the dominant association, as well in other areas along the Tisza. Where the *Carici-Menyanthetum* has appeared the *Caricetum gracilis* surrounds it zonally and it can be separated into several subassociations on the basis of systematically repeated differencial species.

3. Its ecologic conditions in the marsh-land highly differ from those of the areas of its typical occurrence; it shows a richer species combination owing to the more favourable water and nutriment supply as well as in its croplands west of us (Freitag, H. et al., 1958).

4. We have already dealt before, too, with the phytocenologic analysation of the association along the Tisza, many times (Timár 1953; Bodrogközy 1962). We have succeeded in separating two subassociations from the area of Tokaj: *C. gracilis caricetosum vulpinae* Bodrogk. 62 and the *bolboschoenetosum maritimae* Bodrogk. 62.

In the area examined at present we have got the following results:

2. (a) *Caricetum gracilis* (Gräbner et Hueck 31) Tx 37 *typicum* (Nova subass)

1. Its spreading in the examined area is outside the zone of the cropland that became peaty and forms substances of large extension partly in the silted backwaters covered with water only periodically, resp. in their close environs, similarly to those published from the flora district Nógrád (Margit Kovács 1957).

2. It is characteristic of its soil-ecologic conditions that these soils are much younger, first of all of alluvial mud, being characterized by a low organic-matter content and the absence or low value of $CaCO_3$. It is

characteristic of its physical structure that the desilted fraction surpasses 60 per cent and in it the rough mud (with granule diameters of 0,050—0,020) is dominant.

3. The association conditions can be studied on cenologic data Nos. 1—9, Table II, while the dominance relations of the character-species as well their distribution according to floral elements in Fig. 4. Accordingly it is obvious that the number of the *Magnocaricion* species is rather low, the *Carex gracilis* being far the most dominant. Here and there also the dominance value of the *Bolboschoenus maritimus* can be considerable, showing the transition to the *Polygono-Bolboschoenetum,* resp. the development from it (data 7—12, Table II). In these cenoses the number of the *Phragmition* and *Phragmiteltalia* elements and their total covering are essentially higher than in other cenoses of the type (Fig. 4). At the same time, also the value of the *Molinion* and *Molinietalia* species increases.

2. (a_1) C. gracilis typicum baldingerosum

It is a transition towards the *Phalaridetum arundinaceae* Libbert 31, resp. the *Scirpo-Phragmitetum* Kock 26, growing in our area, as well. In this zone the *Magnocaricion* elements decrease, the number and covering of the *Phragmition* and *Phragmitetalia* species are, on the other hand, high; it consists mainly of Cosmopolitan and Circumpolar elements. The high values of the units inside the *Molinio-Juncetea* class develop in the croplands which dry up in the summer period where the *Eleocharis palustris, Lysimachia nummularia Symphytum officinale* species have the leading role (data 10—12, Table II)

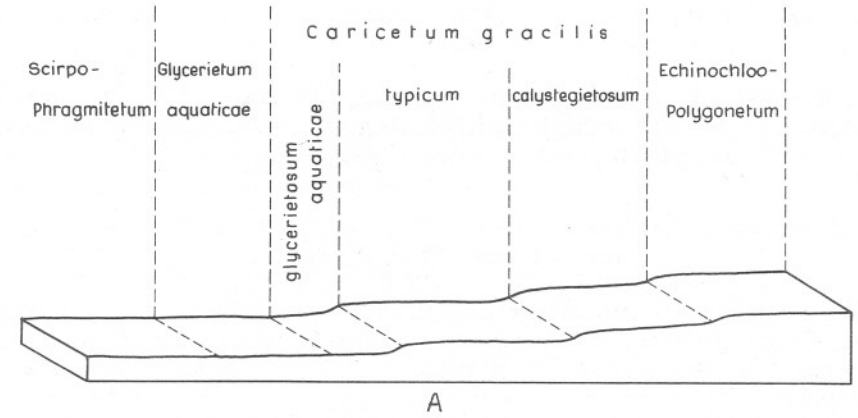
2. (b) Caricetum gracilis (Gräbner et Hueck 31) Tx 37, *glycerietosum aquaticae* (Horvatić 31) Nova subass.

1. This subassociation has a role of facies with Horvatić, in our area, however, with its differenctial species; it can be limited well, and is seperated from it zonally, as well.

2. Its occurence is confined to the silted backwater systems that ensure more humid cropland conditions than those of the type are. Its soil is here and there already marshy.

3. In its cenoses the origin from the *Polygono-Bolboschoenetum* can often be demonstrated; both the *Bolboschoenus maritimus* and the *Polygonum amphibium* frequently occur. By the way, the *Phragmition* and *Phragmitetalia* elements reach also here — apart from some exceptions — the total covering value of 30—40 per cent. In their croplands dried up, from the *Molinion, Agrostion,* and *Molinio-Juncetea* species also here the *Eleocharis palustris Symphytum officinale* substitutes for the former species group.

In the soil growing peaty no *Carici-Menyanthetum* has developed, as yet, but the species combinations of *Caricetum gracilis* are joined by *Equisetum fluviatile, Lathyrus paluster Rumex hydrolapathus Equisetum palustre* in the humid areas (data 19—25, Table II).



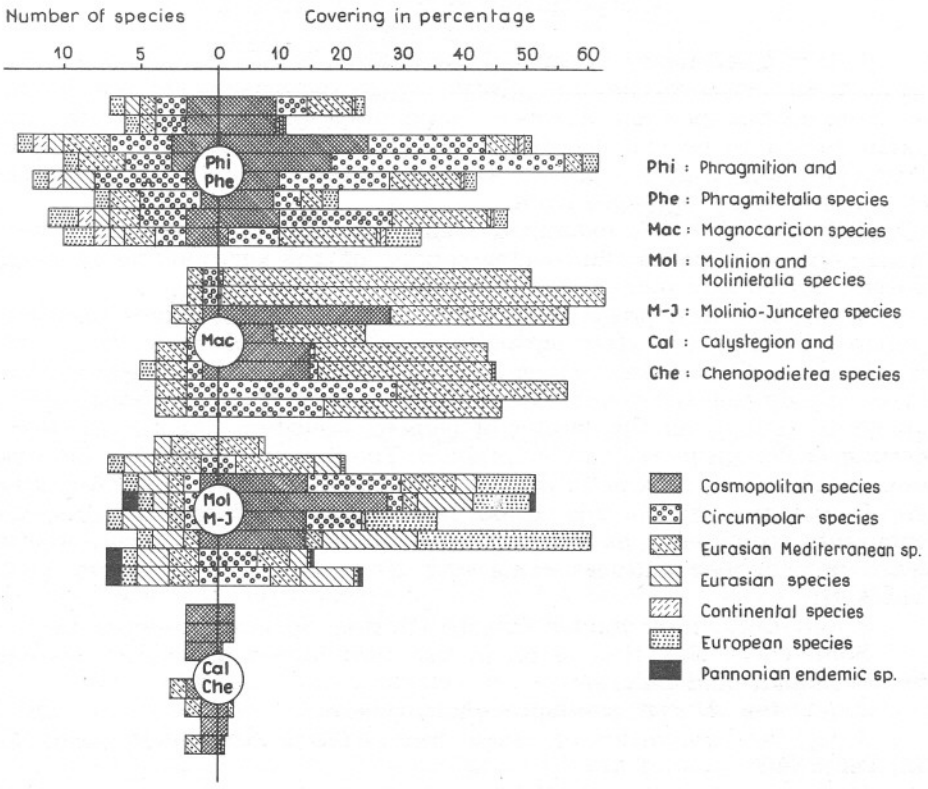


Fig. 4. Zonation of the *Caricetum gracilis* in the area of Tiszaújfalu (A); the diagram indicating the distribution of the dominance and floral elements of the group-, series-, and class-character-species of its species combinations. Construction on the basis of the data of Table II.

2. (b_1) *Caricetum gracilis glycerietosum Equisetum fluviatile* facies.

In the area of Tőserdő *Leersia orysoides* (T i m á r 1953), that occurs elsewhere, too, in the humid, boggy soil along the Tisza, appears *en masse* together with *Iris pseudacorus, Alisma plantago-aquatica.*

2. (c) *Caricetum gracilis* (G r ä b n e r et H u e c k 31) T x 37 *leersietosum* Nova subass.

The height of its substances reaches 80—110 cm. The two dominant species, *Carex gracilis* and *Leersia orysoides* have developed so dense substances that the species combination of their cenoses has become rather poor.

2. (d) *Caricetum gracilis* (G r ä b n e r et H u e c k 31) T x 37 *calystegietosum* Nova subass.

1. It is a secondary version of the association. In the areas considered suitable for producing hoed plants, too, in the drier years, and broken; in more humid periods, however, submerged again under water: they again ceased to be cultivated like plough-lands. The natural vegetation began developing and it proved to be suitable to study the development of the secondary *Magnocaricion.*

2. It occurs in the examined area in the parts not becoming peaty where the standing stratum-water supply of the surrounding sand-hills doesn't get on any more.

3. (a) As a first phase of the succession of the secondary *Caricetum gracilis,* in the year after agriculture being stopped there, the humid cropland conditions and ceasing the competition of other species proved to be highly advantageous for the expansion of some *Nanocyperion* elements, first of all the species of *Cypero-Juncetum* like the *Eleocharis acicularis Potentilla supina Gnaphalium.* The dominating role is, however, due to the group character-species *Bidention, Chenopodion fluviatilis,* and *Calystegion sepii* in this period; however, some *Chenopodietea* species come into prominence, as well, and even the dominant and facies-creating weed of the hoed cultures along the Tisza belongs here (data 1—15, Table III).

2. (c_1) *Caricetum gracilis calystegietosum Sonchus arvensis* fac.

Somewhere else, first of all in the most humid parts that belonged to the plough-land before:

2. (c_2) *the Alisma plantago-aquatica,* resp.:

2. (c_3) *the Symphitum officinale* creates facies (data 6—10, resp. 11—15, Table III).

In the next years, parallelly with spreading of the *Magnocaricion* elements, mainly of the *Carex gracilis, Galium palustre* at the expense of the *Chenopodietea* elements, also the *Molinietalia* species are coming to prominence, first of all the *Eleocharis palustris Lysimachia nummularia Ranunculus repens* (data 16—25, Table III; Fig. 5).

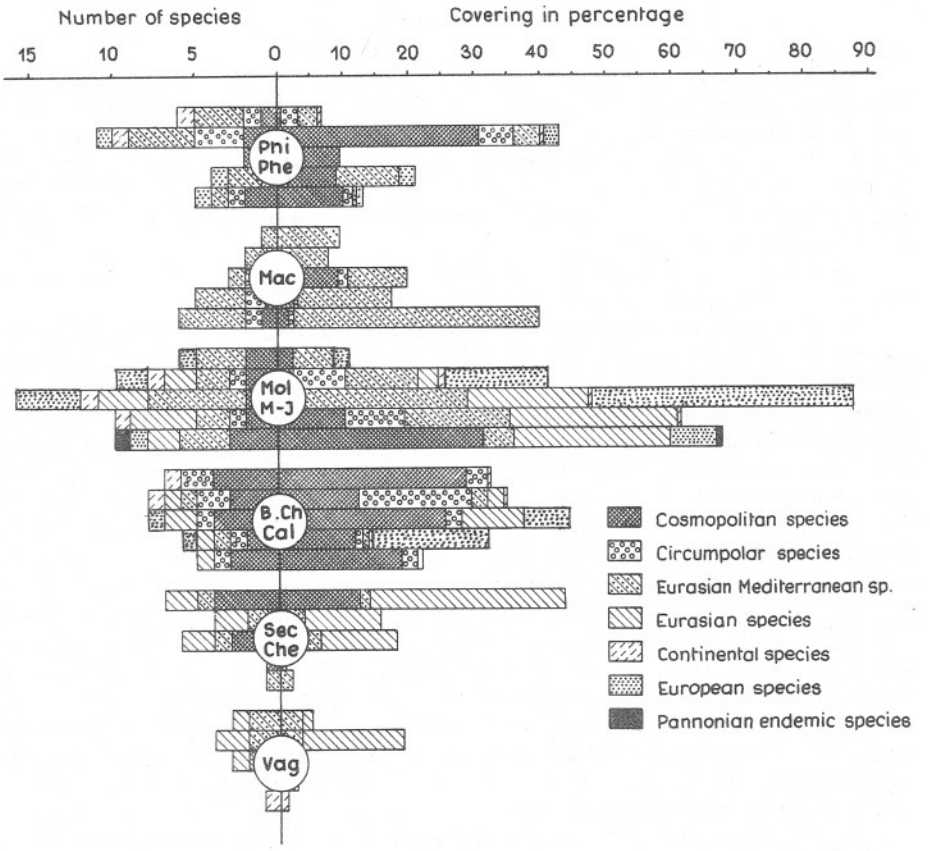


Fig. 5. Dominance relations of the character-species of *Caricetum gracilis calystegietosum* and their distribution according to the floral elements. Construction on the basis of Table III.

Concerning the flora elements no major change can be observed even in the course of succession; the cosmopolitan, circumpolar and Eurasian elements are dominant.

3—5 years after the plough-land cultures having ceased, the succession processes so that the species-combinations of the association approach the species combination of the original *Caricetum gracilis* but, for a longer time, more *Chenopodion fluviatilis* and *Agropyro-Rumicion crispi* species, reflecting the secondary character, have stayed in the association.

Summary

In the course of the vegetation research of the inundation area of Tisza we have repeatedly returned to the detailed examination of the phytocenoses that are different in a greater degree from the others, found so far in one of the largest inundation areas of the Tisza valley, in the neighbourhood of Tiszaug—Alpár and Tiszaújfalu. Amond them some *Magnocaricion* associations can reckon particularly on our interest in an increased degree.

Our work was hastened by the fact that a soil exploitation had started in our area, endangering just these associations.

1. The ecologic conditions of the area have been decisively influenced by the sand and loess ranges heaped up at its western limits. The precipitation devoured by them, directed by a water-closing stratum line, made the water supply of the area flow smooth. As a result of it, rich water-marsh associations have developed; the soil began becoming peaty, and the succession of the marsh and moor vegetation, through the moor and bog-meadow associations, has developed to swamp-woods, the *Calamagrosti-Salicetum cinereae* Soó et Zólyomi 55, resp. *Thelypteridi-Alnetum* (Klika 40) Soó 51, and *Fraxino pannonicae-Alnetum* Soó et Komlódi 60.

2.1. In the non-wooded areas large substances are formed by the *Carici-Menyanthetum* (Nowinsky 28) Soó 55. Its combination is different from that of other associations published from other moorlands of the country: overwhelmingly the *Carex gracilis* makes a subassociation. In spots also the subassociation *Phragmites communis* appears. Besides the substance-forming *Menyanthes trifoliata,* the rarer *Cyperaceae,* like the *Carex intermedia, C. vesicaria,* may be the remainder of an ancient marsh vegetation.

Apart from the *Magnocaricion* elements, there is considerable also the expansion of the *Glycerio-Sparganion,* resp. *Phragmition species,* like the *Equisetum fluviatile, Hippuris vulgaris, Lastrea thelypteris,* etc., in their species combinations.

2.2. In the alluvial or less peaty parts of the examined Tisza inundation area, as well in other similar croplands of the Tisza valley, substances of large size are produced by the *Caricetum gracilis* (Gräbn. et Hueck 31) Rx 37. Its species combinations are essentially poorer than those of the former association. Its separable subassociations are as follows:

2.2.1. *C. gracilis typicum* in humid areas of alluvial soil. In its species combination the number of the *Magnocaricion* species is decreased, far the most dominant being the *Carex gracilis.* Its facies produced by the *Baldingera* shows a transition towards the *Phalaridetum arundinaceae* Libbert 31.

2.2.2. *C. gracilis glycerietosum aquaticae* in backwaters being more humid than those of the type and water-covered for a longer time. Their soil is marshy here and there, in the area of Alpár. In the zone touching the *Carici-Menyanthetum* the facies of *Equisetum fluviatile* appears.

2.2.3. *C. gracilis leersietosum* in marshy meadows, particularly in the area of Tőeserdő, with *Iris pseudacorus, Alisma plantago-aquatica.*

2.2.4. *C. gracilis calystegietosum* is a pioneer population of the association. Its formation can be observed after tillage of the drier areas and later stopping the agricultural cultivation, with several characteristic facies: 4_1 *Sonchus arvensis* fac., in the years following the stoppage of soil cultivation; 4_2 *Alisma plantago-aquatica* and 4_3 *Symphytum officinale* facies, appearing in later times. At last, if the *Carex gracilis* has closed, the development of the association is completed.

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TABLE I.

Carici-Menyanthetum caricetosum gracilis

	Facies:	normale			
	Sample-plot number:	1	2	3	4
	Number of species:	34	30	33	29
	Degree of cover. %:	130	115	110	120
	Association and group character species:				
Cp	*Menyanthes trifoliata*	1—2	2	1—2	2
Cp	*Equisetum fluviatile*	2—3	2	1—2	1—2
Eua(M)	*Carex gracilis*	2	2	2	1—2
Cp	*Caltha palustris*	1	1	2	1—2
Cp	*Lastrea thelypteris*	+	·	1	+—1
Eua(M)	*Galium palustre*	1	1	1	1
Cp	*Scutellaria galericulata*	+	·	+—1	1
Eua	*Calamagrostis canescens*	·	1	1	·
AtlM	*Juncus subnodulosus*	+	+	·	·
	Glycerio-Sparganion and Phragmition species:				
Kosm	*Phragmites communis*	1	1	1	2
Cp	*Baldingera arundinacea*	+—1	·	1	1
Kosm	*Calystegia sepium*	·	·	+—1	+
Kosm	*Hippuris vulgaris*	+—1	·	+	·
Eua(M)	*Epilobium parviflorum*	·	+	·	+
	Phragmitetalia species:				
Eua(M)	*Iris pseudacorus*	1—2	1	+—1	1
Kosm	*Lythrum salicaria*	+—1	1	1	1
Eu	*Sium latifolium*	1	1	+	+—1
Eua	*Lysimachia vulgaris*	1—2	·	1	·
Eua(M)	*Lycopus europaeus*	·	+—1	·	1
Eua(M)	*Oenanthe aquatica*	1	1	·	·
Cp	*Polygonum amphibium*	1	·	+	·
Cp	*Stachys palustris*	·	+	·	1
Eu	*Rumex hydrolapatus*	1—2	·	·	+—1
Eua(M)	*Myosotis palustris*	1	+—1	·	·
Kosm	*Alisma plantag-aquatica*	·	+	·	+
	Molinion-, Agrostion- and Molinietalia species:				
Eua(M)	*Poa trivialis*	1—2	1	2	2—3
Eua(M)	*Mentha aquatica*	+	+	1	1
Kosm(M)	*Potentilla reptans*	1	2	1—2	·
Eua	*Lysimachia nummularia*	1	1—2	1	·
Eua	*Ranunculus repens*	1—2	·	1	1—2
Eua	*Valeriana officinalis*	+—1	·	1	1
Cp	*Equisetum palustre*	·	1	1	1
Eu(AtlM)	*Trifolium hybridum*	+	+	·	·
Eua(M)	*Epilobium tetragonum*	·	+	+	·
Cp	*Agrostis alba*	1—2	2	·	1—2
Eua	*Thalictrum flavum*	1	·	+	·
	Molinio-Juncetea species:				
Eua(M)	*Lychnis flos-cuculi*	1	1	·	+
Kosm	*Prunella vulgaris*	·	+	·	+
	Bidention species:				
Eua(M)	*Bidens tripartitus*	+	·	+	·
Cp	*Bidens cernuus*	·	+	+	·
Kosm	*Echinochloa crus-galli*	+	·	+	·
	Alnion glutinosae species:				
Eua(M)	*Salix cinerea*	1	·	1	·
Eua(M)	*Alnus glutinosa*	1	+	·	·
	Indifferent species:				
Kosm(M)	*Potentilla anserina*	·	1—2	1	1
Kosm	*Taraxacum officinale*	+	·	+	+—1
Eua	*Plantago major*	·	+	+	+

TABLE II.

Caricetum gracilis

Subassociation:		typicum			Baldingera	Glyceria aquatica			
Sample-plot number:		1—3	4—6	7—9	10—12	13—15	16—18	19—21	22—25
Degree of cover. %:		80—90	90—115	100—130	100—120	90—115	100—120	100—110	90—100
Total species number:		16	19	24	20	29	23	25	23
	Association and group character species:								
Eua(M)	*Carex gracilis*	*3—4*	*4*	*2—3*	*2*	*2—3*	*2—3*	*2—3*	*2—3*
Kosm	*Bolboschoenus maritimus*	·	·	*2—3*	*1—2*	*2*	*2*	·	·
Eua(M)	*Galium palustre*	·	·	·	·	+	+	+	+—*1*
Cp	*Equisetum fluviatile*	·	·	·	·	·	·	*2—3*	*2*
Eum(M)	*Teucrium scordium*	·	·	+—*1*	·	·	+	·	·
Cp	*Gratiola officinalis*	·	·	·	·	+	+—*1*	·	·
Cp	*Lathyrus paluster*	·	·	·	·	·	·	+	*1*
Cp	*Veronica scutellata*	+—*1*	+	·	·	·	·	·	·
	Phragmition and Phragmitetalia species:								
Kosm (EuaM)	*Schoenoplectus lacustris*	+	+	*2*	+—*2*	*1—2*	*1—2*	*1—2*	+—*1*
Cp	*Baldingera arundinacea*	*1*	+	+	*2—3*	+	+	·	·
Eu	*Sium latifolium*	·	·	+—*1*	*1*	*1*	*1*	+	*1*
Cp	*Polygonum amphibium*	*1*	+	*1*	*1—2*	+	+	*1—2*	·
Cp	*Glyceria maxima*	·	·	·	+—*1*	*2*	+—*1*	*1—2*	*1—2*
Kosm	*Alisma plantago-aquatica*	·	·	+—*2*	*1*	+—*1*	·	+—*1*	+
Eua	*Lysimachia vulgaris*	+	+	+	·	·	·	+	+
Kosm	*Phragmites communis*	*1—2*	*1—2*	*1*	*1—2*	·	·	·	·
Eu	*Rumex hydrolapathus*	*1*	+	·	·	·	·	*1*	*1*
Cp	*Stachys palustris*	·	·	*2*	·	+—*1*	·	+	+
Kont(Eua)	*Lythrum salicaria*	·	·	*1*	·	+	·	+	+
Eua(M)	*Lycopus europaeus*	*1—2*	·	·	·	·	·	*2*	*2*
Eua(M)	*Sparganium erectum*	·	·	+	+—*1*	*1—2*	·	·	·
Eua(M)	*Butomus umbellatus*	·	·	*1*	+—*1*	*1*	*1*	+	+—*1*
Cp	*Sagittaria sagittifolia*	·	·	·	·	+	*1*	·	·
Cp	*Rorippa amphibia*	·	·	+—*1*	·	+	·	·	·
Eua(M)	*Senecio paludosus*	·	·	*1*	+—*1*	·	+—*1*	·	·
	Nanocyperion species:								
Cp	*Eleocharis acicularis*	·	*1—2*	·	·	*1*	+	·	·
Eua(M)	*Cyperus fuscus*	+	+—*1*	·	·	·	·	·	·
	Molinion-, Agrostion-, Molinietalia- and Molinio-Juncetea species:								
Eua(M)	*Mentha aquatica*	*1*	*1*	*1—2*	·	+	*1*	*1*	*1*
Eua	*Lysimachia nummularia*	+	+—*1*	+—*1*	*1—2*	+	*2*	·	·
Cp	*Agrostis alba*	·	+—*1*	*2*	*1*	*1—2*	·	·	·
Eua	*Ranunculus repens*	·	*1*	*1*	·	·	+	*1*	*1—2*
Eua(M)	*Foa trivialis*	*1*	+—*2*	·	*1*	·	·	*1*	*1*
Kosm	*Eleocharis palustris*	·	·	*2*	*2—3*	*2*	*2*	·	·
Eu(KontM)	*Symphytum officinale*	·	·	*1—2*	*1—2*	*1—2*	*2—3*	·	·
Eu(AtlM)	*Trifolium hybridum*	·	+	·	·	·	·	+	+
Pann E.	*Cirsium brachycephalum*	·	·	·	+—*1*	·	·	+	+
Cp	*Equisetum palustre*	·	·	·	·	·	·	+—*2*	*1—2*
Eua(M)	*Potentilla reptans*	*1*	+—*2*	·	·	·	·	·	·
Eua	*Vicia cracca*	·	·	·	·	·	·	+	+
Eua	*Thalictrum flavum*	·	·	·	·	+—*1*	·	·	·
Eua	*Juncus compressus*	·	·	·	·	+	·	·	·
	Calystegion sepii and Chenopodietea species:								
Kosm (EuaM)	*Calystegia sepium*	+	*1*	+	+—*1*	+	*1*	·	·
Kosm (EuaM)	*Potentilla anserina*	*1*	+—*1*	+—*1*	·	+	·	*1*	+
EuaM	*Rorippa silvestris*	·	·	·	·	+	+	·	+
	Indifferent species:								
Kosm	*Veronica anagallis-aquatica*	·	·	·	·	+—*1*	+	+	·
Eua(M)	*Mentha arvensis*	·	·	·	+	·	*1*	+	·
Eua	*Plantago major*	·	·	·	·	+—*1*	·	·	·

TABLE III.

Caricetum gracilis calystegietosum

Facies:		Sonchus arvensis	Alisma plantago-aquatica	Symhytum officinale	Ranunculus repens	normale
Sample-plot number:		1—5	6—10	11—15	16—20	21—25
Number of species:		33	46	42	27	26
Degree of cover. %:		100	80	90	90	90
	Character species of association and group:					
Eua(M)	*Carex gracilis*	*1—2*	+—*2*	*1—2*	*1—2*	*2—3*
Kosm	*Bolboschoenus maritimus*	·	·	*1—2*	*1*	*1*
Cp	*Gratiola officinalis*	·	·	*1*	+	+—*1*
Eua(M)	*Galium palustre*	·	+	·	*1*	*1—2*
Eua(M)	*Carex vulpina*	·	·	·	*1*	·
	Phragmition- and Phragmitetalia species:					
Kosm	*Alisma plantago-aquatica*	·	*2—3*	+—*2*	*1—2*	*1—2*
Eu	*Sium latifolium*	·	*1*	·	*1*	+—*1*
Cp	*Polygonum amphibium*	*1*	*1*	·	·	+—*1*
Eu(M)	*Iris speudacorus*	+	·	·	*1—2*	+
Kosm	*Phragmites communis*	+	·	*1*	·	+—*1*
Eua(M)	*Butomus umbellatus*	+	*1*	·	·	·
Eua(M)	*Lycopus europaeus*	*1*	+	·	·	·
Kont(Eua)	*Lythrum salicaria*	+	+	·	·	·
Eua(M)	*Sparganium erectum*	·	+	·	+	·
Cp	*Baldingera arundinacea*	·	*1*	·	·	·
Kosm (EuaM)	*Schoenoplectus lacustris*	·	*1*	·	·	·
Eua(M)	*Senecio paludosus*	·	+	·	·	·
Cp	*Rorippa amphibia*	·	+	·	·	·
	Nanocyperion species:					
Eua M	*Potentilla supina*	*1*	·	*1—2*	·	·
Eua	*Gnaphalium uliginosum*	+—*1*	·	*1*	·	·
Cp	*Eleocharis acicularis*	·	*1—2*	+	·	·
Eua(M)	*Cyperus fuscus*	+	+	·	·	·
	Agrostion species:					
Eua(M)	*Poa trivialis*	*1*	*1—2*	+—*1*	+—*2*	+—*1*
Kosm	*Alopecurus pratensis*	·	+	·	+—*1*	*1*
Eu(M)	*Ranunculus sardous*	·	+	+	·	+—*1*
Kont(Eua)	*Lythrum virgatum*	·	+—*1*	+	+	·
Eu(M)	*Centaurium minus*	·	·	*1*	·	·
	Molinietalia species:					
Eu(KontM)	*Symphytum officinale*	*1*	*2*	*2—3*	·	+—*2*
Cp	*Agrostis alba*	·	*1—2*	*1*	*1—2*	·
Eua	*Ranunculus repens*	·	*1*	+—*2*	*1—3*	·
Eua	*Lysimachia nummularia*	·	*1*	·	*1*	*2*
Eua(M)	*Potentilla reptans*	*1*	·	·	*1—2*	+—*1*
Kosm	*Eleocharis palustris*	·	·	·	*1—2*	*2—3*
Eua	*Juncus compressus*	·	·	·	*1*	*1—2*
Eu(AtlM)	*Trifolium hybridum*	·	·	*1—2*	·	·
Eua M	*Epilobium tetragonum*	·	+	·	·	·
	Molinio-Juncetea species:					
Eua	*Vicia cracca*	·	*1*	*1—2*	*1*	·
Eua(M)	*Trifolium repens*	·	*1*	*1—2*	·	*1*
Kosm(Eua)	*Taraxacum officinale*	+—*1*	+	+	·	·
Eua(M)	*Medicago lupulina*	·	+	*1*	·	·
Kosm (EuaM)	*Prunella vulgaris*	·	·	+	·	+
Eua(M)	*Daucus carota*	+	·	*1*	·	·
Eua(M)	*Trifolium pratense*	·	·	+	·	·
	Beckmannion species:					
Eua M	*Lotus tenuis*	·	*1*	+	·	·
Eua M	*Trifolium fragiferum*	·	+—*1*	·	·	·
	Bidention-, Chenopodion					

Molinietalia species:

Eu(KontM)	*Symphytum officinale*	*1*	*2*	*2—3*	·	*+—2*
Cp	*Agrostis alba*	·	*1—2*	*1*	*1—2*	·
Eua	*Ranunculus repens*	·	*1*	*+—2*	*1—3*	·
Eua	*Lysimachia nummularia*	·	*1*	·	*1*	*2*
Eua(M)	*Potentilla reptans*	*1*	·	·	*1—2*	*+—1*
Kosm	*Eleocharis palustris*	·	·	·	*1—2*	*2—3*
Eua	*Juncus compressus*	·	·	·	*1*	*1—2*
Eu(AtlM)	*Trifolium hybridum*	·	·	*1—2*	·	·
Eua M	*Epilobium tetragonum*	·	+	·	·	·

Molinio-Juncetea species:

Eua	*Vicia cracca*	·	*1*	*1—2*	*1*	·
Eua(M)	*Trifolium repens*	·	*1*	*1—2*	·	*1*
Kosm(Eua)	*Taraxacum officinale*	*+—1*	+	+	·	·
Eua(M)	*Medicago lupulina*	·	+	*1*	·	·
Kosm (EuaM)	*Prunella vulgaris*	·	·	+	·	+
Eua(M)	*Daucus carota*	+	·	*1*	·	·
Eua(M)	*Trifolium pratense*	·	·	+	·	·

Beckmannion species:

Eua M	*Lotus tenuis*	·	*1*	+	·	·
Eua M	*Trifolium fragiferum*	·	*+—1*	·	·	·

Bidention-, Chenopodion fluviatilis-, Calystegion sepii and Agropyro-Rumicion crispi species:

Kosm(Eua)	*Calystegia sepium*	*1—2*	*+—2*	*1—3*	*1—2*	*+—2*
Cp	*Bidens tripartitus*	+	*2*	*1*	*+—1*	*1*
Kosm (EuaM)	*Potentilla anserina*	·	*1*	*1*	*1*	*1*
Eua	*Rumex crispus*	·	·	+	+	+
Kosm	*Polygonum lapathifolium*	*1—2*	·	*1*	·	·
Kosm	*Echinochloa crus-galli*	*1—2*	·	*1*	·	·
Eu(M)	*Carex hirta*	·	·	*+—2*	*1—3*	·
Cp	*Rorippa silvestris x amphibia*	*1*	*+—1*	·	·	·
Eua	*Chenopodium polyspermum*	+	*1*	·	·	·
Kosm(Cp)	*Veronica anagallis-aquatica*	·	*1*	·	·	*1—2*
Eua	*Chrysanthemum vulgare*	·	·	*1—2*	·	·
Eua(M)	*Scutellaria hastifolia*	·	*1*	·	·	·
Kosm(M)	*Setaria glauca*	*+—1*	·	·	·	·
Eua (KontM)	*Chenopodium urbicum*	·	·	·	*+—1*	·
Kont(Eu)	*Rorippa austriaca*	·	+	·	·	·

Secalinion-, Secalietea- and Chenopodietea species:

Eua(Kosm)	*Sonchus arvensis*	*2—3*	*1—2*	*1—2*	·	·
Kosm	*Equisetum arvense*	*1—2*	·	*1*	*1*	·
Eua(M)	*Cirsium arvense*	*1*	*1*	*1*	·	·
Eua(M)	*Rorippa silvestris*	·	*+—1*	·	·	*+—1*
Eua	*Matricaria inodora*	*1*	*1*	·	·	·
Kosm(Eua)	*Sonchus asper*	*1*	·	+	·	·
Kosm(M)	*Anagallis femina*	+	·	+	·	·
Kosm	*Chenopodium album*	+	·	·	·	·
Eua	*Inula britannica*	·	·	*1*	·	·
Adv	*Erigeron canadensis*	·	·	+	·	·

Indifferent species:

Eua	*Plantago major*	*1*	*2*	*+—1*	*1*	*+—1*
Eua(M)	*Mentha arvensis*	+	*1*	+	·	·
Kosm	*Polygonum aviculare*	·	+	*1*	·	·
Eua (KontM)	*Heleochloa alopecuroides*	*1*	·	·	·	·
Med(Eum)	*Mentha pulegium*	+	·	·	·	·
Eua	*Glechoma hederacea*	·	+	·	·	·