

VEGETATION TYPES OF MOSAIC-COMPLEXES IN THE MIDDLE-TISZA REGION

O. Makra and M. Zalatnai

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Abstract: After the water regulation along the Middle–Tisza region, the area of the semi-natural wetlands decreased and the vegetation strongly fragmented. Semi-natural habitats which still survived are thus of high conservation importance.

The goal of the study was to survey the recent characteristic vegetation types of the region of the inundated flood area and the protected floodplain outside the dike. The examined site was a habitat-complex close to Rákóczifalva. It is unique in this region because the semi-natural patch-mosaic extended to the flood protected side ensuring between-habitat connections on both parts of the floodplain. We surveyed 6 habitats of a semi-natural zonation-complex, 2 forest stands of native tree species and a hybrid poplar plantation in the region of Csataszög. In forests and grasslands phytocoenological relevés were made. The evaluation of the vegetation was performed on the basis of their naturalness by using Simon's nature conservation ranks of the Hungarian vascular plants (NCR), Borhidi's classification of the Hungarian vascular plants (social behaviour types SBT) and the relative ecological indicator values by Borhidi. The phytocoenological relevés were analyzed by PCA. Temporal changes of the vegetation in landscape level during the last 200 years were examined using historical maps and aerial photographs. We completed the recent vegetation map of the area at Rákóczifalva and compared with that by Timár (1952). Later map is first published in this paper.

Keywords: Middle-Tisza region, vegetation, habitat map, landscape history

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Introduction

The semi-natural wetlands were limited to small area along the River Tisza after the water regulation (Schweitzer 2003). The inundation area was divided into two parts with dikes: the more or less regularly inundated flood plain and the protected flood plain outside the dike. Patches of the original vegetation became smaller and more isolated in consequences of the river control and the intensive land use. There is no any site in the floodplain which remained completely in its natural state. Therefore, the still existing semi-natural areas are of conservation importance (Gallé and Körmöczi 2004).

Majority of the floodplain is too narrow to support natural zonation complex in the Middle-Tisza region, and the few broader sections are dominated by arable lands and forest plantations.

The studied habitat-complexes near Rákóczifalva and Csataszög are among the few exceptions where there are wide inundated floodplains dominated by quasi-natural vegetation. The Rákóczifalva area is unique in this region because the semi-natural patch-mosaic extends to the flood protected side ensuring between-habitat connections at both parts of the floodplain.

The area has been poorly studied. Timár made a vegetation map at Rákóczifalva in 1952, and beside this, one botanical survey was carried out in 2004 (Gulyás and Lukács 2004).

Our aim was to describe the vegetation of the typical habitat types in the Middle-Tisza region.

As further water management interventions (new bank forming, extending the floodplain region, making a flood-decreasing valley) are planned to improve the safety against floods ("New Vásárhelyi

Plan”), the present study could be considered as a state-assessment before the interventions.

Materials and methods

Region

Middle-Tisza Region is a 254 km section of the river from Tokaj to Cibakháza. Within this region, the examined areas are found at the western edge of the loess ridge of Szolnok. The climate is continental in this geographical region (summer is hot and the average annual precipitation is about 500 mm without precipitation maximum in autumn). The soil of the studied region is mostly silt and clay (Pécsi 1969).

Study sites

The study sites are situated at 47°4'20" north 20°11'20" east and at 47°15'30" north 20°23'40" east, at Rákóczifalva and at Csataszög, respectively and both belong to the Middle-Tisza Landscape Protection Area.

The habitat complex along the river consists of eight main habitat types (sample sites in bracket), willow-poplar gallery forest (Csataszög), planted hybrid poplar forest (Csataszög), inundated floodplain oak forest (Csataszög), marshy meadow (Rákóczifalva), secondary marsh and steppe vegetations on the slopes of the dike (Rákóczifalva) and meadow and oak plantation in the protected flood area (both at Rákóczifalva).

High inundation reaches regularly the floodplain during spring. Inundations can be experienced periodically only in the depression along the dike in case of an intensive and long-lasting flooding in the protected flood area. The studied area lies in the matrix of intensive cultivated areas (Fig. 5).

Methods

Investigations were performed twice in 2003 in May and in August. Flora of the habitat patches was drawn up for both examined regions, Csataszög and Rákóczifalva. The vegetation was sampled with at least five quadrates of 2×2 m area in the grasslands and of 10×10 m in the forests. Relevés of the two periods were drawn together for the further analysis.

Habitat map of the area at Rákóczifalva was made by using the National Habitat-classification System (Bölöni *et al.* 2003) nomenclature and it was digitalized by ArcView 3.2 software.

We used also the maps of the historical First, Second and Third Military Surveys of Hungarian Kingdom, an aerial photograph from the 50s and one

made at 2004 to follow the landscape level changes till nowadays. The recent vegetation types are compared with the vegetation map by Timár (1952), which was digitalized for this purpose.

Vegetation of the habitats was evaluated on the basis of their naturalness using Simon's system of nature conservation ranks of the Hungarian vascular plants (Horváth *et al.* 1995) and Borhidi's detailed classification of social behaviour types of the Hungarian vascular plants (Borhidi 1995). We also applied the relative ecological indicator values by Borhidi to characterize the habitats: soil moisture (WB), soil reaction (RB), ammonia-nitrate supply (NB) and salinity (SB) (Horváth *et al.* 1995). During the evaluation we calculated both the number of species belonging to a given category and the species number weighted by the percentage cover.

PCA ordination of the coenological relevés were made by Syntax 5.0. (Podani 1995). The relevés of the grasslands and forests were analysed separately.

Landscape history

Large wetlands without extensive woodlands characterized the studied landscape at the second part of the 18th century on the basis of the map by First Military Survey of Hungary. Different vegetation types can not be distinguished on that map (Fig.1).

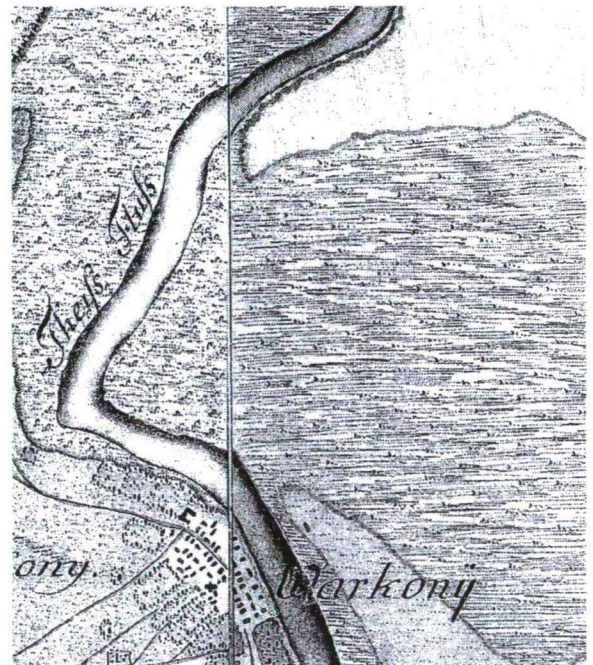


Fig.1. The examined area at the time of the First Military Survey (1782-85)

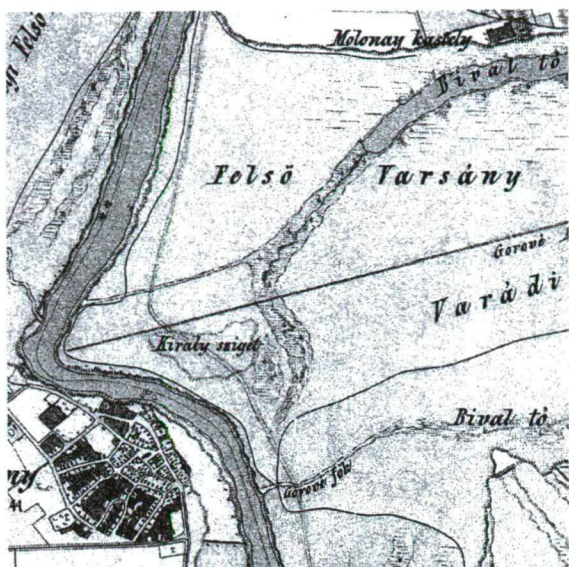


Fig. 2. The area at the time of the Second Military Survey (1819-69)



Fig. 3. The area at the time of the Third Military Survey (1872-87)

The Second Military Survey (1819-1869) presumably carried out during or after the river regulation, showed a landscape structure similar to the present situation. It is noticeable on the map that the so-called Bival-lake was an earlier separated backwater connecting to the River Tisza at one point. There were designated reed and tall sedge vegetation patches on the surroundings of the backwater. Probably, these deep-lying habitats were

under permanent water cover all the year. The centre of the area was possibly covered by some kind of meadow vegetation (Fig. 2).

The Third Military Survey (1872-1887) was definitely made after the river regulation; the area was similar to the recent conditions. Trees were indicated scattered on the floodplain. No separated vegetation patches are indicated on this map-scale (Fig. 3).

Results and discussion

Evaluation of the previous researches

In the 1950s, Timár investigated the vegetation of the Tisza valley between Szolnok and Szeged. He distinguished four types of the floodplain meadow vegetation and two forest types in this region (Fig. 4). One considerable deficiency is found when comparing the aerial-photograph from 1950 with Timár's vegetation map. Timár marked only one willow-poplar forest stand along the riverbank, but according to the aerial-photograph there was a larger stand of it at the northern end of the area, too.

Actualizing Timár's nomenclature, we could say that the stand of *Carici vulpinae-Alopecuretum pratensis* occurred at the largest extension and *Carex melanostachya* became dominant locally in the wetter parts. Due to the lack of coenological relevés, one could not decide whether the *Caricetum melanostachyae* facies was distinguished on association-level. We consider Timár's vegetation type "*Alopecuretum pratensis-Artemisieto-Festucetum pseudovinae*" as *Agrostio-Alopecuretum pratensis*. According to this, there was already some sodic character in one part of the meadow at the 50s.

Another surveying was performed in this area at 2004. A habitat map and a floristic list were made at the floodplain within this scope. Researchers found 145 species and 9 habitat types in the course of their survey (Gulyás and Lukács 2004).

Description and evaluation of the vegetation types

Willow gallery forest (WGF)

The forest that was found along the dike on the area of Csataszög consisted of dominant disturbance tolerant and adventive species. These species were dominant at every layer but one. The dominants of the upper foliage were *Salix alba*, *S. triandra* and *Populus nigra*. *Fraxinus pennsylvanica* dominated the lower foliage in almost one hundred per cent. Three adventive species occurred in the upper shrub layer also dominated by *Fraxinus pennsylvanica*. In the lower shrub layer *Rubus caesius* was in the highest proportion. Herb layer consisted of some

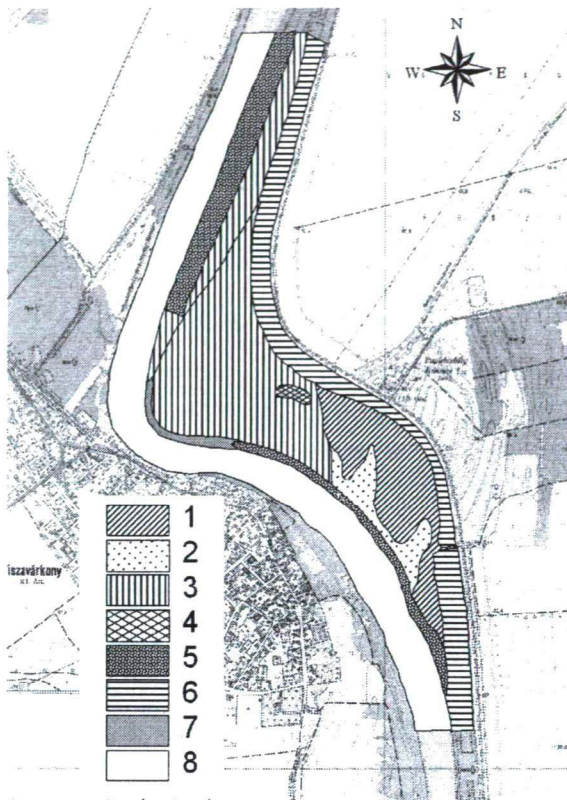


Fig. 4. Vegetation map of the region at Rákóczi falva by Timár at 1952. He used the following association names: 1: *Alopecuretum pratensis-Artemisieta-Festucetum pseudovinae*, 2: *Alopecuretum pratensis, Carex melanostachya fac.*, 3: *Alopecuretum pratensis, Carex praecox fac.*, 4: *Glycyrrhizetum echinatae*, 5: *Salicetum albae-triandrae*, 6: *Populeto-Salicetum albae, Rubus caesius degraded fac.*, 7: sandbank, 8: River Tisza

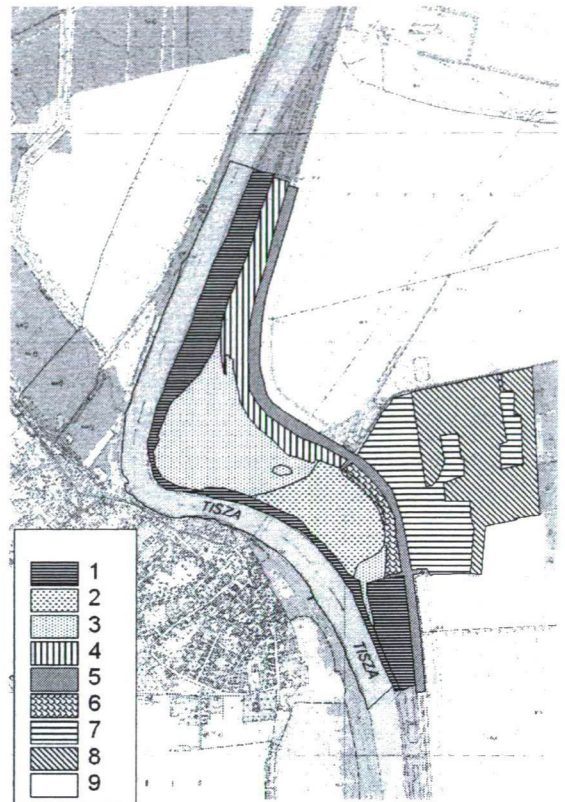


Fig. 5. The habitat map of the examined region at 2003.

1: willow poplar (*Salicetum albae-fragilis*), 2: floodplain marsh meadow (*Caricetum melanostachyae* × *Agrostio-Alopecuretum pratensis*), 3: marsh meadow dominated by *Amorpha fruticosa*, 4: willow plantation along the dike 5: dike, 6: hybrid poplar plantation, 7: grassland in the flood protected area, 8: oak forest in the flood protected area, 9: River Tisza

seedlings of the species, which are mainly adventive, of the upper strata. Species indicating the natural state of the stand were sporadically present: *Clematis vitalba*, *Lysimachia nummularia*, *Equisetum palustre*, *Lycopus europaeus*. The only protected plant was *Leucosium aestivum*, rare and characteristic species of the *Salicetum albae-fragilis* association.

Considering the relative ecological indicator values, basifrequent plants and those of neutral soils were dominant. In respect of the distribution of WB (soil water content) indicator values, the plants of not well aerated soils and semi-humid, fresh and moist soils were dominant. Several categories of the NB (ammonia-nitrate supply) were represented, dominated by the plants of moderately nutrient rich habitats and species indicating mineralogen nitrogen rich soil on the basis of coverage of species (Tables 1-6.).

Poplar plantation (PP)

The foliage consisted only of *Populus* × *hybrida*. Four adventive species constituted the shrub stratum, among them the coverage of *Amorpha fruticosa* was almost one hundred per cent, the other three ones – *Acer negundo*, *Fraxinus pennsylvanica*, *Echinocystis lobata* – occurred sporadically. Species referring to the naturalness of the stand appeared sparsely: *Lysimachia vulgaris*, *L. nummularia*, *Lycopus europaeus*, *Iris pseudacorus*.

Plants of neutral and weakly alkaline soils were dominant. Considering the distribution of the WB (soil moisture) values, plants of semi-humid, fresh and moist soils were dominant on the basis of the coverage of species, but when taking only the number of species into account the distribution of the values was more balanced. There was the same dichotomy regarding the distribution of the ammonia-nitrate supply values. Various categories

were divided in almost the same proportion on the basis of the number of species, but plants of habitats moderately nutrient rich and extremely rich in nitrogen were in higher proportion when considering the percentage cover (Tables 1-6.).

Oak plantation (OP)

This stand found in the floodplain in the area of Csataszög was very poor of species, only four species occurred. *Quercus robur* dominated the upper foliage, and the lower stratum was formed by *Fraxinus pennsylvanica*. Herb layer coverage was sparse consisting mainly of seedlings, the *Quercus robur* saplings occurred sporadically. One protected species, *Leucocjum aestivum*, was recorded.

Floodplain meadow

The meadow lying in the region of Rákóczfalva is the property of the Directorate of the Environmental Conservation and Water Management of the Middle-Tisza Region. The protected area is managed by Hortobágy National Park. It was mowed by decreasing intensity over the last 15 years. The meadow was not harrowed and drilled up in the last 20 years (Tallósi, personal communication).

Two vegetation types were distinguished, *Caricetum melanostachyae* developed on the depressions and *Agrostio-Alopecuretum pratensis* was found in the backs. On the northern part of the meadow *Amorpha fruticosa* formed large homogeneous patches by the end of August, and *Glycyrrhiza echinata* spread on the southern part because of the non convenient management.

Caricetum melanostachyae (FM1)

Generalists (*Carex melanostachya*), disturbance tolerants (*Glycyrrhiza echinata*, *Lysimachia nummularia*) and ruderal competitors (*Elymus repens*) dominated the stand. Most of the natural association-forming species appeared sporadically: *Scutellaria hastifolia*, *Lythrum virgatum*, *Poa pratensis*. High proportion of *Elymus repens* and spreading of the *Glycyrrhiza echinata* and *Amorpha fruticosa* after the mowing at the end of August indicated the disturbance and degradation of the area.

Basifrequent and weakly salt tolerant plants are predominant. Considering the distribution of the soil moisture values, plants indicating the wet, not well aerated soils dominated. Distribution of the NB (ammonia-nitrate supply) values showed that the area is mesotrophic when considering the species number, but on the basis of the coverage values species demanding mineralogen, nitrogen rich soils and those of the submesotrophic habitats were

present in the highest proportion (Tables 1-6.).

Agrostio-Alopecuretum pratensis (FM2)

The stand was a degraded form of *Agrostio-Alopecuretum pratensis*. At the time of our investigation, few marsh-meadow species were present because of the dry year.

According to the distribution of Borhidi's social behavior types the competitors (*Alopecurus pratensis*) dominated, but considering the number of species the disturbance tolerants (*Galium verum*, *Glycyrrhiza echinata*), weeds (*Lathyrus tuberosus*, *Sonchus oleraceus*, *Vicia sativa*) and ruderal competitors (*Cynodon dactylon*, *Elymus repens*) gave the highest proportion of the flora. Characteristic of the most species belonging to the above-mentioned behaviour types that they spread out during the vegetation period after some disturbances (e.g. mowing).

Species not occurring on salty soils appeared in high number, but according to the coverage two categories – salt tolerant plants, soils with high chloride content – were present in the highest proportion. The polyhaline *Limonium gmelinii* was in high cover, which caused the second peak in the distribution of SB values (salinity). Neutral, basifrequent and basifilous species were the determinants on the basis of the distribution of the soil reaction values. The soil moisture demand of the species was various, but plants of the fresh soils were present with the highest covering. Plants indicating mineral nitrogen rich soils were dominant (Tables 1-6.).

Dike

A dike was already marked on the map of the Second Military Survey. Both slopes of the dike face to semi-natural patches. One side exposed to the flood area was connected to a willow shelter-forest and a floodplain meadow described previously, an extensive grassland was situated next to the other dike side.

Vegetation of the dike slope facing to the flood area (D1)

Vegetation stripes typical of dikes could be found here (Bodrogközy 1968). At the lower part of the slope hygrophilous and marsh-meadow species were dominant: *Alopecurus pratensis*, *Galium boreale*, *Poa pratensis*, *Thalictrum lucidum*. The upper zone was more disturbed, steppe-like vegetation developed here with the following species: *Salvia nemorosa*, *Cardaria draba*, *Knautia arvensis*, *Plantago lanceolata*. At the top of the dike,

Cynodonto-Poetum angustifoliae association was found along the road.

The main elements of the plant assemblages were neutral and basiphilous plants. The dike provided habitats for species with many kinds of soil moisture demands. Considering the nitrogen supply, the distribution of the species covered a wide range in the indicator spectrum. On the basis of the coverage habitats of mesotrophic and mineralogen nitrogen rich species dominated (Tables 1-6.).

Vegetation of the dike slope facing to the protected flood area (D2)

The grassland of the outer dike slope could be regarded as a very disturbed, secondary loess steppe with few species. Determinative elements of the flora belonged to Gramineae: *Festuca pseudovina*, *Poa angustifolia*, *Elymus repens*. These and other species indicated the natural state of the habitat such as *Salvia nemorosa*, *S. austriaca* and *Achillea pannonica*. The upper zone of the dike was covered by *Cynodonti-Poetum angustifoliae* association.

Considering the soil reaction and the coverage the dominant plants were basifrequent and basiphilous. This slope was much drier than the other side, plants of semi-dry habitats and xero-tolerant species prevailed. The distribution of the NB (nitrogen supply) values was wide, but plants indicating moderately oligotrophic and mesotrophic habitats were present in larger proportion (Tables 1-6.).

Grassland on the protected flood area (GP)

The grassland outside the dike was not managed regularly. It was grazed by sheep at the 1990s and later it was occasionally pastured, trodden and mown in some patches. There were some weedy patches on the area because of the manure and other organic matter deposited there (Tallósi, personal communication).

Several patch-types of the natural vegetation developed in this area. Near the bottom of the dike a permanent water-covering appeared usually during the spring, and *Carex melanostachya* and *Alopecurus pratensis* dominated vegetation fragments developed. In these patches mainly Cyperaceae and Gramineae prevailed (*Carex melanostachya*, *C. praecox*, *Alopecurus pratensis*, *Poa pratensis*, *Elymus repens*), other species were present in lower cover. The most important vegetation type of this grassland is a remnant of *Peucedano-Asteretum sedifolii*, with both protected species, *Peucedanum officinale* and *Aster sedifolius*. This vegetation type was one of the most characteristic associations of the Hungarian Great Plain mosaic with *Galatello-Quercetum roboris* (Borhidi 2003).

At the southern part of the grassland farther from the dike, the effects of drying and alkalization became more intense. Mosaics of *Achilleo setaceae-Festucetum pseudovinae*, *Camphorosmetum annuae* and reeds were found on the deeper relief. Appearing characteristic species of the grassy saline "puszta" were as follows: *Festuca pseudovina*, *Poa angustifolia*, *Limonium gmelinii*, *Achillea pannonica*, *Matricaria chamomilla*. Several smaller patches of the area were dominated by weeds.

This florula is dominated by the disturbance tolerant, generalist and competitor species. It was not of strong saline character considering the distribution of salt-tolerance and soil-reaction indicator values of the flora and the vegetation. Plants indicating neutral, basifrequent and basiphilous soils and weakly sodic habitats were present in the highest proportion with several polyhaline species. We found several patches with high salt concentration without any plant coverage, which did not appear in the diagrams. Plants of extremely dry, semi-dry and fresh-soil habitats were dominant, but in the flora a wide indicator range appeared. With respect to the distribution of the ammonia-nitrate supply the species of the oligotrophic, submesotrophic, mesotrophic and mineral nitrogen rich habitats were present in higher proportion (Tables 1-6.).

Oak forest on the protected area (OFP)

The forest is a 50 years old plantation with grass fragments in the deeper relief. *Quercus robur* dominated in the foliage almost one hundred per cent, *Populus alba*, *P. nigra*, *Robinia pseudo-acacia*, *Tilia platyphyllos*, *Fraxinus excelsior* mixed with low coverage in it. Cover of the upper foliage was 60-70 per cent. In the lower foliage *Acer pseudoplatanus* dominated some patches, *Acer platanoides* and *Ulmus laevis* were present in lower abundance. The shrub layer was rare, it consisted of partly young seedlings of *Acer pseudoplatanus*, *Acer platanoides*, *Ulmus laevis*, *Ulmus minor*, *Robinia pseudo-acacia*, partly *Rosa sp*, *Prunus spinosa*, *Rubus caesius* and in some patches *Amorpha fruticosa*. No *Quercus robur* seedlings were found in this layer. Monodominant plant patches alternated in the herb layer. The following species were presented in high abundance here: *Calamagrostis epigeios*, *Poa angustifolia*, *Carex spicata*, *Elymus repens*, *Urtica dioica*, *Galium aparine*. Most of the species occurred sporadically: *Cucubalus baccifer*, *Quercus robur*, *Mycelis muralis*, *Vincetoxicum hirundinaria*, *Symphytum officinale*, *Angelica sylvestris*, *Cirsium arvense*. Three protected species, *Ornithogalum pyramidale*, *Cephalanthera damasonium* and

Epipactis sp., were found in the older stands.

Robinia pseudo-acacia plantation ran along the edge of some forest sections with the following degradation indicator species at the herb layer: *Urtica dioica*, *Conyza canadensis*, *Ambrosia artemisiifolia*, *Daucus carota*, *Cichorium intybus*, *Elymus repens*. Some *Robinia pseudo-acacia* dominated patches were found inside of the oak forest and seedlings of the robinia spread over the neighbouring stands, too.

Some extended grasslands wedged in the oak forest. On its deeper part *Phragmites australis* dominated vegetation developed with some *Elaeagnus angustifolia*. The other species were: *Cirsium arvense*, *Lycopus exaltatus*, *Dipsacus laciniatus*. Marsh-meadow fragments survived on the higher relief dominated by *Alopecurus pratensis*.

Other species, as *Aster sedifolius*, *Poa angustifolia*, *Agrimonia eupatoria*, *Epilobium pusillum*, *Galium aparine*, *Symphytum officinale*, *Carduus acanthoides* occurred here.

Generalist, disturbance tolerant and competitor species were in higher proportion in the flora, and competitors prevailed considering the coverage frequency of species. On the basis of the soil reaction it could be characterized with neutral, basifrequent and basiphilous plants. Salty soil character is not indicated by the species present. Plants of fresh soils were present in high cover but considering the flora a wide range of the indicator values shared in it. Plants indicating submesotrophic habitats were in high cover but regarding the flora a wider range of the indicator values appeared (Tables 1-6.).

Table 1. Distribution of the species numbers (A) and those weighted by the percentage cover (B) among the categories of the social behavior types of the flora by Borhidi (SBT). Abbreviations of the categories: C: Competitors, S: Specialists, Sr: rare specialists, G: Generalists, Gr: rare generalists, NP: Natural Pioneers, DT: Disturbance Tolerants, W: Weeds, I: Introduced alien species, A: Adventives, RC: Ruderal Competitors, AC: Alien Competitors Abbreviations of the habitats: WGF: willow gallery forest, PP: poplar plantation, OP: oak plantation, FM1: floodplain meadow, lower part, FM2: floodplain meadow, upper part, D1: dike slope facing to the protected area, D2: dike slope facing to the protected flood area, GP: grassland on the protected flood area, OFP: oak forest on the protected flood area.

A

SBT	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFP
C	3	1	1	1	1	3	3	5	9
S	1	0	0	0	2	2	2	2	2
Sr	1	0	1	0	0	0	0	0	0
G	1	1	0	5	2	11	4	14	9
NP	0	0	0	0	1	0	1	2	0
DT	5	6	0	5	4	27	9	25	16
W	3	1	0	0	4	11	3	8	3
I	2	1	2	0	1	2	0	0	2
A	1	1	0	0	0	0	0	0	0
RC	0	1	0	1	4	5	2	5	5
AC	2	2	1	0	2	2	0	2	3

B

SBT	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFP
C	47	0	76	14	31	7	13	34	70
S	0	0	0	0	18	5	7	1	4
Sr	1	0	0	0	0	0	0	0	0
G	14	0	0	37	8	29	8	24	4
NP	0	0	0	0	4	0	0	0	0
DT	16	57	0	27	12	29	38	26	28
W	0	0	0	0	1	16	24	0	2
I	106	2	132	0	0	0	0	0	24
A	0	0	0	0	0	0	0	0	0
RC	0	0	0	19	17	33	16	13	8
AC	14	92	0	0	0	8	3	0	3

Table 2. Distribution of the species numbers (A) and those weighted by the percentage cover (B) among the categories of Nature Conservation Ranks by Simon (NCR). Abbreviations of the categories: U: unique or rare species, KV: strictly protected species in Hungary, V: protected species in Hungary, E: native edificatory species, K: native accessorial species, TP: natural pioneer species, TZ: disturbance tolerant native species, A: adventive species, G: cultivated species, GY: weeds. (For the legend of the habitats see Table 1.)

A

NCR	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFP
U	0	0	0	0	0	0	0	0	0
KV	0	0	0	0	0	0	0	0	0
V	1	1	1	0	0	2	0	2	1
E	3	1	1	2	1	2	3	4	5
K	5	3	0	5	4	16	7	17	13
TP	0	0	0	0	0	2	1	2	0
TZ	4	4	0	3	7	19	8	19	16
A	1	1	0	0	0	0	0	0	0
G	3	2	3	0	2	4	1	0	3
GY	2	2	0	2	7	18	4	20	11

B

NCR	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFP
U	0	0	0	0	0	0	0	0	0
KV	0	0	0	0	0	0	0	0	0
V	1	0	0	0	0	6	0	2	0
E	47	0	76	49	31	2	11	29	79
K	14	3	0	15	31	44	37	29	13
TP	0	0	0	0	0	2	2	0	0
TZ	16	72	0	14	21	37	22	27	20
A	0	0	0	0	0	0	0	0	0
G	120	75	133	0	0	4	0	0	25
GY	0	0	0	20	9	32	35	13	6

Table 3. Distribution of the species numbers (A) and those weighted by the percentage cover (B) among the categories (1-9) of soil reaction of the habitats (RB). (For the legend of the habitats see Table 1.)

A

RB	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFFP
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	1	0	0	1
5	0	0	0	1	1	2	1	3	3
6	9	7	2	3	6	24	5	21	17
7	6	2	2	4	7	12	9	19	16
8	3	4	0	4	6	20	9	21	10
9	0	0	0	0	0	1	0	0	0

B

RB	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFFP
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	1
5	0	0	0	19	8	14	11	11	2
6	29	78	76	16	31	45	2	28	78
7	43	71	43	37	45	34	49	31	21
8	33	0	0	25	8	33	44	30	17
9	0	0	0	0	0	0	0	0	0

Table 4. Distribution of the species numbers (A) and those weighted by the percentage cover (B) among the categories (1-9) of the nitrate supply of the habitats (NB). (For the legend of the habitats see Table 1.)

A

NB	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFFP
1	0	0	0	0	2	0	1	3	0
2	0	0	0	0	0	4	3	10	3
3	1	0	0	1	3	10	6	14	6
4	3	3	1	2	4	9	3	12	8
5	0	1	0	6	4	17	6	11	2
6	3	1	2	0	3	6	1	3	11
7	6	4	0	2	3	10	4	8	12
8	3	2	1	1	1	4	0	2	2
9	2	2	0	0	0	1	0	1	3

B

NB	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFFP
1	0	0	0	0	4	0	0	2	0
2	0	0	0	0	0	10	4	14	4
3	0	0	0	1	12	11	32	36	16
4	3	2	76	47	0	4	25	13	66
5	0	0	0	15	35	54	30	9	0
6	41	74	44	0	1	10	0	0	8
7	44	18	0	34	39	29	15	27	20
8	1	0	0	0	0	5	14	0	1
9	16	55	0	0	0	3	0	0	5

Table 5. Distribution of the species numbers (A) and those weighted by the percentage cover (B) among the categories (0-9) of the salt concentration of the soil of the habitats (SB). (For the legend of the habitats see Table 1.)

A

SB	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFFP
0	18	12	4	6	12	50	17	43	42
1	0	1	1	6	5	8	4	11	4
2	0	0	0	0	0	1	0	2	0
3	0	0	0	0	1	1	1	4	1
4	0	0	0	0	0	0	0	1	0
5	0	0	0	0	1	0	1	2	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	1	1	1	1	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0

B

SB	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFFP
0	105	149	209	27	22	100	47	37	115
1	0	0	0	70	47	25	42	43	4
2	0	0	0	0	0	0	0	2	0
3	0	0	0	0	4	1	12	16	1
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	18	1	5	1	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0

Table 6. Distribution of the numbers (A) and those weighted by the percentage cover (B) among the categories (1-12) of the soil moisture of the habitats (WB). (For the legend of the habitats see Table 1.)

A

WB	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFFP
1	0	0	0	0	0	0	0	1	0
2	0	0	0	0	3	4	2	4	2
3	1	0	0	1	3	14	10	15	7
4	1	2	0	0	4	13	6	15	9
5	2	1	1	1	5	7	2	10	10
6	2	1	2	3	3	7	3	5	8
7	4	4	1	2	2	5	0	6	8
8	4	2	0	3	0	8	0	3	3
9	4	3	0	2	0	3	1	4	0

B

WB	WGF	PP	OP	FM1	FM2	D1	D2	GP	OFFP
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	4	5	2	3	0
3	0	0	0	1	17	38	79	32	19
4	0	0	0	0	4	18	5	21	3
5	14	74	0	19	9	18	15	11	18
6	13	18	119	15	50	25	6	22	73
7	27	55	0	24	8	8	0	1	6
8	3	2	0	1	0	11	0	0	1
9	36	1	0	36	0	3	0	9	0

Multivariate evaluation

On the basis of the ordination, the floodplain meadow and the protected floodplain meadow stands separate from the dike grasslands. The points of the two meadows are rather diffuse, they form elongated parallel clouds. It indicates the large inner heterogeneity of these areas. The floodplain meadow has a lower (wetter) and an upper (drier) part and these two areas separate from each other sharply in the ordination diagram. The upper part is not only drier but its soil has alkaline characteristics, too. The points of the protected flood area divide into two groups on the diagram, because this meadow is very mosaic-like: drier, wetter, and sodic patches of vegetation combine. Both slopes of the dike are similar to each other and have more homogeneous vegetation.

Three major effects which are correlated with each other could cause this point-pattern: the change of the sodic character of the habitat-patches, a moisture gradient away from the river and the differences in the degree of floods (Fig. 6.)

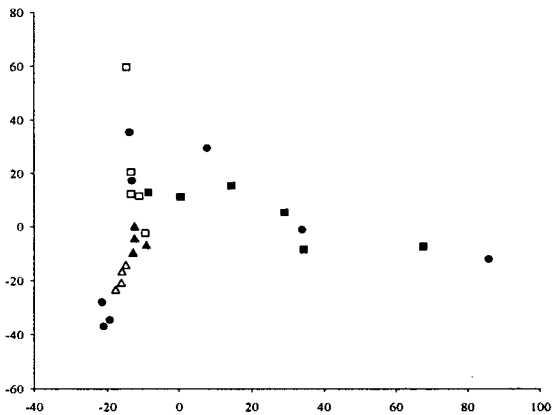


Fig.6. Ordination diagram of the grasslands. ■ lower part of the floodplain meadow □ upper part of the floodplain meadow ▲ dike slope facing to the floodplain △ dike slope facing to the protected floodplain ● protected floodplain meadow

Ordination of the forest relevés showed the expected results, the relevés of the forest types are well separated from each other. Its primary reason was the different foliage species composition (oak, willow, poplar). The same invasive species (*Amorpha fruticosa*, *Acer negundo*, *Fraxinus pennsylvanica*) constituted the shrub layers, and the herb layers were rare in species in both stands. The ordination points of the oak plantations of the protected and non-protected floodplain partly overlapped. Some stands are very far from the

overlap because of more tree species in the upper canopy and the richer herb layer (Fig. 7).

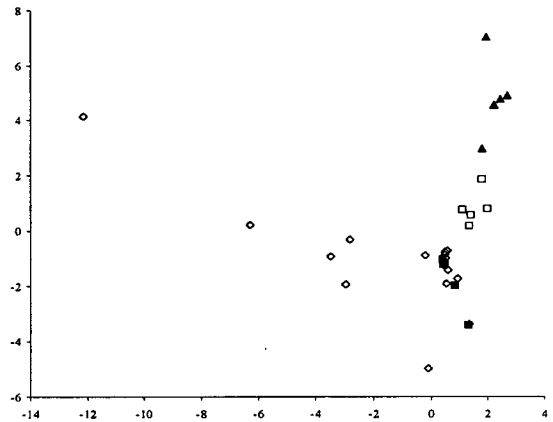


Fig. 7. Ordination diagram of the forests. ■ Oak plantation □ Willow gallery forest ▲ Poplar plantation ◇ Oak forest on the protected area

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Map of the First Military Survey (1782-85)

Map of the Second Military Survey (1819-1869)

Map of the Third Military Survey (1872-1887)

Appendix

Average coverage values of the species at the nine examined vegetation types

FM1: floodplain meadow 1, deeper part, FM2: floodplain meadow 2, upper part, D1: dike slope facing to the flood area, D2: dike slope facing to the protected flood area, GP: grassland on the flood protected area, OFP: oak forest in the flood protected area, OP: oak plantation, WGF: willow gallery forest, PP: poplar plantation

species / habitats	FM1	FM2	D1	D2	GP	OFP	WGF	PP	OP
upper foliage									
<i>Populus alba</i>	0,0	0,0	0,0	0,0	0,0	1,0	0,0	0,0	0,0
<i>Populus hybrida</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	44,0	0,0
<i>Populus nigra</i>	0,0	0,0	0,0	0,0	0,0	0,3	10,0	0,0	0,0
<i>Quercus robur</i>	0,0	0,0	0,0	0,0	0,0	32,5	0,0	0,0	76,0
<i>Quercus rubra</i>	0,0	0,0	0,0	0,0	0,0	0,3	0,0	0,0	0,0
<i>Robinia pseudo-acacia</i>	0,0	0,0	0,0	0,0	0,0	1,5	0,0	0,0	0,0
<i>Salix alba</i>	0,0	0,0	0,0	0,0	0,0	0,0	33,3	0,0	0,0
<i>Salix fragilis</i>	0,0	0,0	0,0	0,0	0,0	0,0	14,0	0,0	0,0
<i>Ulmus laevis</i>	0,0	0,0	0,0	0,0	0,0	1,3	0,0	0,0	0,0
lower foliage									
<i>Acer platanoides</i>	0,0	0,0	0,0	0,0	0,0	4,5	0,0	0,0	0,0
<i>Acer pseudoplatanus</i>	0,0	0,0	0,0	0,0	0,0	3,5	0,0	0,0	0,0
<i>Fraxinus angustifolia</i>	0,0	0,0	0,0	0,0	0,0	0,0	3,3	0,0	0,0
<i>Fraxinus excelsior</i>	0,0	0,0	0,0	0,0	0,0	1,5	0,0	0,0	0,0
<i>Fraxinus pennsylvanica</i>	0,0	0,0	0,0	0,0	0,0	0,0	54,0	0,0	0,0
<i>Morus alba</i>	0,0	0,0	0,0	0,0	0,0	0,0	13,3	0,0	43,3
<i>Tilia platyphyllos</i>	0,0	0,0	0,0	0,0	0,0	1,0	0,0	0,0	0,0
shrub layer									
<i>Acer negundo</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	16,0	0,0
<i>Acer platanoides</i>	0,0	0,0	0,0	0,0	0,0	2,1	0,0	0,0	0,0
<i>Acer pseudoplatanus</i>	0,0	0,0	0,0	0,0	0,0	2,1	0,0	0,0	0,0
<i>Amorpha fruticosa</i>	0,0	0,0	0,0	0,0	0,0	0,5	5,0	67,0	0,0
<i>Echinocystis lobata</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Fraxinus pennsylvanica</i>	0,0	0,0	0,0	0,0	0,0	0,0	12,0	0,0	76,0
<i>Populus alba</i>	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0
<i>Prunus spinosa</i>	0,0	0,0	0,0	0,0	0,0	1,5	0,0	0,0	0,0
<i>Rosa sp.</i>	0,0	0,0	0,0	0,0	0,0	1,5	0,0	0,0	0,0
<i>Ulmus laevis</i>	0,0	0,0	0,0	0,0	0,0	0,4	0,0	0,0	0,0
<i>Ulmus minor</i>	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0
grass layer									
<i>Acer negundo</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	1,8	0,0
<i>Achillea pannonica</i>	0,0	0,0	0,3	1,7	7,5	0,0	0,0	0,0	0,0
<i>Agrimonia eupatoria</i>	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0
<i>Agrostis stolonifera</i>	0,0	0,0	0,0	0,0	1,3	0,6	0,0	0,0	0,0
<i>Allium sp.</i>	0,0	0,0	0,3	0,0	0,0	0,0	0,0	0,0	0,0
<i>Alopecurus pratensis</i>	14,3	31,0	1,5	0,3	16,4	1,0	0,0	0,0	0,0
<i>Amorpha fruticosa</i>	0,0	0,2	3,8	0,0	0,0	0,0	9,0	6,7	0,4
<i>Angelica sylvestris</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Aristolochia clematitidis</i>	0,0	0,0	6,3	0,0	0,0	0,0	0,0	0,1	0,0

(Appendix continued)

species / habitats	FM1	FM2	D1	D2	GP	OFF	WGF	PP	OP
<i>Arrhenatherum elatius</i>	0,0	0,0	0,0	3,8	0,0	0,6	0,0	0,0	0,0
<i>Artemisia pontica</i>	0,0	0,0	4,3	2,0	0,0	0,0	0,0	0,0	0,0
<i>Bidens tripartitus</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Bromus inermis</i>	0,0	0,0	3,8	0,0	0,0	0,0	0,0	0,0	0,0
<i>Bromus mollis</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Bromus tectorum</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Calamagrostis epigeios</i>	0,0	0,0	0,0	0,0	0,0	4,5	0,0	0,0	0,0
<i>Capsella bursa-pastoris</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Cardaria draba</i>	0,0	0,0	3,8	23,8	0,0	0,0	0,0	0,0	0,0
<i>Carduus acanthoides</i>	0,0	0,0	0,7	0,0	0,6	0,0	0,0	0,0	0,0
<i>Carduus sp.</i>	0,0	0,0	0,0	0,0	1,3	0,0	0,0	0,0	0,0
<i>Carex hirta</i>	0,0	0,0	0,7	0,0	0,0	0,5	0,0	0,0	0,0
<i>Carex melanostachya</i>	34,2	0,0	0,0	0,0	20,5	0,0	0,0	0,0	0,0
<i>Carex praecox</i>	1,4	8,2	3,3	6,8	0,0	0,0	0,0	0,0	0,0
<i>Centaurea pannonica</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Cephalanthera damasonium</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Cerastium dubium</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Chenopodium vulvaria</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Cirsium arvense</i>	0,0	0,1	1,0	0,0	0,1	0,2	0,0	0,0	0,0
<i>Clematis integrifolia</i>	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0
<i>Clematis vitalba</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Convolvulus arvensis</i>	0,0	0,0	0,0	0,0	3,1	0,0	0,0	0,1	0,0
<i>Cucuballis baccifer</i>	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0
<i>Cynodon dactylon</i>	0,0	9,2	18,6	5,0	1,9	0,0	0,0	0,0	0,0
<i>Dactylis glomerata</i>	0,0	0,0	0,3	0,0	0,0	0,0	0,0	0,0	0,0
<i>Daucus carota</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Dianthus giganteiformis sp. pontederac</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Echinocystis lobata</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Elymus repens</i>	19,3	8,0	13,8	11,3	5,6	2,1	0,0	0,0	0,0
<i>Equisetum palustre</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Eryngium campestre</i>	0,0	0,0	0,3	0,0	0,7	0,1	0,0	0,0	0,0
<i>Euphorbia cyparissias</i>	0,0	0,0	0,4	0,0	0,0	0,0	0,0	0,0	0,0
<i>Euphorbia lucida</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Euphorbia virgata</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Falcaria vulgaris</i>	0,0	0,0	0,0	0,3	0,0	0,0	0,0	0,0	0,0
<i>Festuca pratensis</i>	0,0	0,0	0,0	0,3	0,0	0,0	0,0	0,0	0,0
<i>Festuca pseudovina</i>	0,0	0,0	1,4	12,0	28,1	1,5	0,0	0,0	0,0
<i>Fraxinus pennsylvanica</i>	0,0	0,0	0,0	0,0	0,0	0,0	27,0	1,6	12,8
<i>Galium aparine</i>	0,0	0,0	0,0	0,0	0,0	1,3	0,0	0,0	0,0
<i>Galium boreale</i>	0,0	0,0	5,3	0,0	0,0	0,0	0,0	0,0	0,0
<i>Galium verum</i>	0,0	4,0	0,0	1,3	11,9	1,9	0,0	0,0	0,0
<i>Geranium molle</i>	0,0	0,0	0,2	0,0	0,0	0,0	0,0	0,0	0,0
<i>Glechoma hederacea</i>	0,0	0,0	6,3	0,0	0,0	0,0	0,0	0,0	0,0
<i>Glycyrrhiza echinata</i>	11,7	7,5	0,9	0,0	0,0	0,0	0,0	0,0	0,0
<i>Humulus lupulus</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Iris pseudacorus</i>	0,0	0,0	0,5	0,0	0,0	0,0	0,0	0,0	0,0
<i>Juncus compressus</i>	0,0	0,0	0,3	0,0	0,0	0,0	0,0	0,0	0,0
<i>Knautia arvensis</i>	0,0	0,0	0,5	0,0	0,0	0,0	0,0	0,0	0,0
<i>Koeleria cristata</i>	0,0	0,0	0,0	0,0	0,3	0,0	0,0	0,0	0,0
<i>Lactuca serriola</i>	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0
<i>Lamium purpureum</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Lathyrus tuberosus</i>	0,0	0,2	0,3	0,0	0,0	0,0	0,0	0,0	0,0
<i>Lens culinaris</i>	0,0	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0
<i>Leucojum verum</i>	0,0	0,0	0,0	0,0	0,0	0,0	1,2	0,0	0,1
<i>Limonium gmelini</i>	0,0	18,3	0,7	5,0	11,0	0,0	0,0	0,0	0,0
<i>Linaria vulgaris</i>	0,0	0,0	2,2	0,0	0,0	0,0	0,0	0,0	0,0
<i>Lotus corniculatus</i>	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0

(Appendix continued)

species / habitats	FM1	FM2	D1	D2	GP	OFF	WGF	PP	OP
<i>Lycopus europaeus</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,5	0,0
<i>Lycopus exaltatus</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Lysimachia nummularia</i>	12,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Lysimachia vulgaris</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2,1	0,0
<i>Lythrum virgatum</i>	0,2	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0
<i>Matricaria chamomilla</i>	0,0	0,0	0,0	0,0	0,6	0,0	0,0	0,0	0,0
<i>Medicago falcata</i>	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0
<i>Melandrium album</i>	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0
<i>Mycelis muralis</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Myosotis ramosissima</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Ornithogalum umbellatum</i>	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0
<i>Papaver confine</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Pimpinella saxifraga</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Plantago lanceolata</i>	0,0	0,0	2,0	0,1	0,1	0,0	0,0	0,0	0,0
<i>Plantago media</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Poa angustifolia</i>	0,0	0,0	0,7	10,0	11,3	13,8	0,0	0,0	0,0
<i>Poa nemoralis</i>	0,0	0,0	0,0	0,0	0,0	0,5	0,0	0,0	0,0
<i>Poa pratensis</i>	0,0	0,0	14,8	0,0	5,0	0,0	0,0	0,0	0,0
<i>Populus alba</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Populus nigra</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Potentilla argentea</i>	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0
<i>Potentilla reptans</i>	0,5	0,2	1,9	0,0	0,0	0,0	0,0	0,0	0,0
<i>Prunus spinosa</i>	0,0	0,0	0,0	0,0	0,0	4,2	0,0	0,0	0,0
<i>Quercus robur</i>	0,0	0,0	0,0	0,0	0,0	0,2	0,0	0,0	0,1
<i>Ranunculus pedatus</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Ranunculus polyanthemus</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Ranunculus repens</i>	0,0	0,0	0,5	0,0	0,0	0,0	0,0	0,0	0,0
<i>Ranunculus sardous</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Rorippa austriaca</i>	0,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Rosa canina</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Rubus caesius</i>	0,0	0,0	2,5	0,0	0,0	1,1	15,0	53,3	0,0
<i>Rumex confertus</i>	2,0	0,0	2,2	0,0	0,0	0,0	0,0	0,0	0,0
<i>Salvia austriaca</i>	0,0	0,0	0,0	1,5	0,0	0,0	0,0	0,0	0,0
<i>Salvia nemorosa</i>	0,0	0,0	5,0	20,0	0,0	0,0	0,0	0,0	0,0
<i>Salvia pratensis</i>	0,0	0,0	0,0	0,0	1,9	0,0	0,0	0,0	0,0
<i>Scabiosa ochroleuca</i>	0,0	0,0	0,4	0,0	0,0	0,0	0,0	0,0	0,0
<i>Scorzonera cana</i>	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0
<i>Scutellaria hastifolia</i>	0,8	0,0	1,4	0,0	0,0	0,0	0,0	0,0	0,0
<i>Setaria pumila</i>	0,0	6,0	0,0	0,0	0,0	0,5	0,0	0,0	0,0
<i>Silene multiflora</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Solanum dulcamara</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Sonchus asper</i>	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0
<i>Sonchus oleraceus</i>	0,0	0,2	0,5	0,0	0,0	0,0	0,0	0,0	0,0
<i>Stenactis annua</i>	0,0	0,0	3,8	0,0	0,9	0,2	0,0	0,0	0,0
<i>Symphytum officinale</i>	0,0	0,0	3,9	0,0	0,0	0,2	0,0	0,0	0,0
<i>Taraxacum officinale</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Thalictrum lucidum</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Trifolium striatum</i>	0,0	4,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Trinia ramosissima</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Urtica dioica</i>	0,0	0,0	0,0	0,0	0,0	1,3	0,7	1,3	0,0
<i>Valerianella locusta</i>	0,0	0,0	1,8	1,6	0,0	0,0	0,0	0,0	0,0
<i>Verbena officinalis</i>	0,0	0,0	2,1	0,0	0,0	0,0	0,0	0,0	0,0
<i>Veronica prostrata</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Vicia angustifolia</i>	0,0	0,0	1,6	0,0	0,0	0,0	0,0	0,0	0,0
<i>Vicia sativa</i>	0,0	0,8	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<i>Vincetoxicum hirundinaria</i>	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0