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VEGETATION MAPPING AS A BASE OF BOTANICAL GIS APPLICATIONS II. VEGETATION MAP OF THE VAJSZLÓ FOREST (SW HUNGARY)

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Vegetation map (1 : 10,000) of the Vajszló Forest (Baranya county) together with a description of the occurring communities (*Scillo vindobonensi-Ulmetum* Kevey 1996, *Fraxino pannonicae-Carpinetum* Soó et Borhidi in Soó 1962, *Paridi quadrifoliae-Alnetum* Kevey 1996) and their types are presented. Communities and types were compared by ecological indicator values. The vegetation map – together with geological, hydrological and forestry data – will be integrated into a GIS, which will provide new methods for analyzing the relationship between plant communities and their environment.

Key words: vegetation mapping, GIS, ecological indicator values

INTRODUCTION

A fundamental question of vegetation science is the spatial relationship between plant communities and their environment. Geographical information systems (GIS) provide a promising new tool for investigating this connection. GIS is a special area of informatics, where the main organizing principle of storing, handling and analyzing information is spatial arrangement and real spatial relations (Gross 1995). The most important GIS applications on botany in Hungary were mentioned in Ortmann-Ajkai (1999).

Vegetation maps of two near-natural forests of the Drava plain were created – beyond collecting basic floristical and coenological data about a little-known area – for the sake of investigating the connection between plant associations and their environment using the possibilities provided by the GIS. In this article a 1 : 10,000 vegetation map of the Vajszló Forest – the bigger and higher-laying one – will be presented (Fig. 1).

Previous botanical studies of the area were mentioned in Ortmann-Ajkai (1999).

MATERIALS AND METHODS

STUDY AREA

The Vajszló Forest is situated in Baranya county (SW Hungary), in an area encircled by the villages Vajszló, Sámod, Bogádmindszent and Páprád. Before the water regulation this was the inun-

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dation area of Fekete-víz, a stream running to the Drava, with some sandy elevation rising 5–10 m above this level. With an area of about 600 ha it is one of the greatest unbroken forests of the Drava plain, which consists mainly of near-natural stands.

Most of the area is covered by oak-ash-elm gallery forests (*Scillo vindobonensi-Ulmetum*), on the highest parts lowland hornbeam-oak forests (*Fraxino pannonicae-Carpinetum*). The area is crossed by Konica canal, which is bordered by a narrow stripe of lowland alder grove (*Paridi quadrifoliae-Alnetum*). There are some plantations of *Robinia pseudacacia* and *Juglans nigra*.

RESULTS AND DISCUSSION

VEGETATION MAP UNITS

Hardwood gallery forest

Scillo vindobonensi-Ulmetum Kevey 1996 (Appendix 1) covers most of the former inundation area of Fekete-víz, where abandoned streambeds are clearly recognizable, especially in spring, when they are often covered with water. Oak-ash-elm gallery forests develop mostly on places with changing water conditions, on alluvial forest soil, more rarely on humus-rich alluvial soil or on rusty brown forest soil. According to herb layer, five types were distinguished.

Carex sylvatica type

This is the driest form of the oak-ash-elm gallery forests, transitionary toward hornbeam-oak forests. In the canopy besides, *Quercus robur* and *Carpinus betulus*, *Fraxinus angustifolia* is common (K = 3), and sometimes *Ulmus laevis* can be found, too. The shrub layer is usually missing, but in some places its cover can reach 30–40%. Constant species of herb layer: *Carex sylvatica*, *Hedera helix*, *Brachypodium sylvaticum*, *Galium odoratum*, *Circaea lutetiana*, *Scrophularia nodosa* and saplings of *Acer campestre*, *Fraxinus angustifolia* and *Ulmus minor*. From the *Carex sylvatica* type of hornbeam-oak forests it can be distinguished by the constancy of *Circaea lutetiana* and *Fraxinus angustifolia* saplings; *Impatiens noli-tangere* and *Rubus caesius* can occur with significant cover; *Ligustrum vulgare*, constant in the similar type of hornbeam-oak forests, is not common here and *Stellaria holostea* missing completely. Protected species are: *Carex strigosa*, *Lonicera caprifolium*, *Neottia nidus-avis*.

Fig. 1. Vegetation map of the Vajszló Forest

Galeobdolon luteum type

Dominant grove forest type northeast of Konica canal. In the canopy *Fraxinus angustifolia* is more common than *Quercus robur* (K = 5 and 4, respectively), although its maximum cover is 40%. *Carpinus betulus* occurs with a constancy of 4. Shrub layer is medium or very thick, rich in species: consists of *Acer campestre*, *Cornus sanguinea*, *Ulmus minor*, *Carpinus betulus*, *Ligustrum vulgare*, less often of *Corylus avellana*, *Crataegus oxyacantha*, *Fraxinus angustifolia*, *Sambucus nigra* and *Ulmus laevis*. Constant species of herb layer: *Galeobdolon luteum*, *Acer campestre*, *Hedera helix*, *Rubus caesius* (its cover sometimes exceeds 50%), *Brachypodium sylvaticum*, *Pulmonaria officinalis*. Protected species are: *Carex strigosa*, *Cephalanthera longifolia*, *Epipactis helleborine*, *Lonicera caprifolium*, *Neottia nidus-avis*, *Platanthera bifolia*.

Circaea lutetiana type

It occurs on the southern part of the study area. Among the types covering large, continuous areas, this one can be found in the lowest parts. The canopy is species-rich: *Quercus robur* dominates over *Fraxinus angustifolia* in constancy and also in cover, *Carpinus betulus* can be found less often and with smaller cover than in the former two types. *Acer campestre*, *A. tataricum*, *Ulmus laevis* and *U. minor* are common, too, sometimes *Populus alba* becomes dominant. The shrub layer is thick, species-rich: *Cornus sanguinea*, *Crataegus monogyna*, *Sambucus nigra*, *Ligustrum vulgare* and sapling of the trees of canopy: *Acer campestre*, *A. tataricum*, *Carpinus betulus*, *Fraxinus angustifolia*, *Ulmus laevis*, *U. minor*. Constant species of the herb layer: *Circaea lutetiana*, *Acer campestre*, *Hedera helix* (sometimes in masses), *Rubus caesius*, *Fraxinus angustifolia*, *Geum urbanum*, *Galium odoratum* and *Urtica dioica*. Protected species are: *Carex strigosa*, *Dryopteris carthusiana*, *Epipactis helleborine*, *Listera ovata*, *Ruscus aculeatus*, *Tamus communis*.

The following two types occur only in smaller extensions, indicating small-scale variations of habitat.

Carex remota type

On the deepest points: in bottoms of former streambeds which are covered with water for weeks in springs. Because of the long-lasting water cover, the herb layer is often very sparse. If thicker, *Carex remota* is constant, although usually only with 5–10% cover. Canopy and shrub layer are similar to that of *Circaea lutetiana* type (patches of *Carex remota* type are usually embedded in stands of *Circaea* type). Constant species of the herb layer are: besides *Carex remota* common grove forest species: *Hedera helix*, *Rubus caesius*, *Geum urbanum*, *Galium odoratum*, *Circaea lutetiana*, *Urtica dioica*, and saplings of *Acer campestre* and *Fraxinus angustifolia*. Protected species are *Carex strigosa* and *Dryopteris carthusiana*.

Galium odoratum type

Galium odoratum is a very common species here, constant in almost all types of grove and hornbeam-oak forests. In *Galium odoratum* type not its occurrence is characteristic, but that in this type it occurs in masses, and very often other species are missing. Similar facts can be said about *Hedera helix*: the two species can occur beside each other, competing out almost every other species. So this type could be named *Galium-Hedera* type, too.

This type characteristically occurs in the border zone between grove and hornbeam-oak forests (these are more species-rich stands) and embedded in oak-ash-elm grove forest stands there, where – because of large cover of *Carpinus betulus* – herb layer gets very little light: here shade-tolerant (L = 2) *Galium odoratum*, and *Hedera helix* (which can obtain more light climbing into the canopy layer) compete out other species, so these stands are very species-poor.

In the canopy *Quercus robur* and *Fraxinus angustifolia* are dominant, in the second canopy or the shrub layer *Carpinus betulus* occurs with large cover value. The shrub layer is usually thick. In the herb layer constant species are: beside *Galium odoratum* (up to 40% cover) and *Hedera helix* (up to 50%) *Brachypodium sylvaticum*, *Pulmonaria officinalis*, *Viola sylvestris*, *Euonymus europaeus*, *Circaea lutetiana* and saplings of *Acer campestre* and *Carpinus betulus*. Protected species are *Listera ovata*, *Lonicera caprifolium*, *Neottia nidus-avis* and *Ruscus aculeatus*.

Illyrian lowland hornbeam-oak forest

Fraxino pannonicae-Carpinetum Soó et Borhidi in Soó 1962 (Appendix 2) association occurs in the highest-lying western and central parts of the area and in smaller patches in the northeastern part, too. They occur usually in water-independent habitats (less often in habitats with changing water conditions), most often on rusty brown forest soils. *Ruscus aculeatus*, an Illyrian species, is com

mon, some others (*Carex strigosa*, *Tamus communis*, *Primula vulgaris*, *Polystichum setiferum*) can be found sporadically. Two herb layer types can be distinguished.

Stellaria holostea type

The highest-lying, driest stands. Constant species of the canopy are *Quercus robur* and *Carpinus betulus*; *Fraxinus angustifolia* and *Acer campestre* are less common (K = 3). The shrub layer is sparse or medium-thick (max. 35%). Constant species of the herb layer besides *Stellaria holostea* are: *Hedera helix*, *Brachypodium sylvaticum*, *Rubus caesius*, *Dactylis polygama*, *Crataegus monogyna*, *Carex sylvatica*, *Pulmonaria officinalis*, *Viola sylvestris*, and saplings of *Acer campestre*. Protected species are *Cephalanthera longifolia*, *Dryopteris carthusiana*, *Epipactis helleborine*, *Platanthera bifolia*, *Polystichum aculeatum*, *Polystichum setiferum*, *Primula vulgaris*, *Ruscus aculeatus*.

Carex sylvatica type

Transitiory type towards oak-ash-elm grove forests. The canopy and the shrub layer are similar to that of *Stellaria holostea* type. Constant species of the herb layer besides *Carex sylvatica* are *Hedera helix*, *Brachypodium sylvaticum*, *Rubus caesius*, *Pulmonaria officinalis*, *Ligustrum vulgare*, *Galium odoratum*, *Cornus sanguinea*, *Viola sylvestris* and saplings of *Acer campestre*, *Quercus robur*, *Carpinus betulus*. It can be distinguished from the *Carex sylvatica* type of grove forests by constant occurrence of *Ligustrum vulgare* and by the fact that some grove forest species (*e.g. Circaea lutetiana*, *Fraxinus angustifolia*, *Rubus caesius*) occur with smaller frequency and cover. Protected species are *Cephalanthera longifolia*, *Dryopteris carthusiana*, *Epipactis helleborine*, *Lonicera caprifolium*, *Neottia nidus-avis*, *Platanthera bifolia*, *Quercus farnetto*, *Ruscus aculeatus*, *Tamus communis*.

Lowland alder grove

Alongside Konica canal a narrow strip of *Paridi quadrifoliae-Alnetum* Kevey 1996 (Appendix 3) can be found, mostly its *fraxinetosum angustifoliae* consociation. Other, rarer consociations are *alnetosum glutinosae* and *populetosum albae*. The shrub layer consists mostly of *Acer campestre*, *Cornus sanguinea* and *Ulmus minor*. Herb layer is sparse, with lots of swamp species (*Carex riparia*, *Iris pseudacorus*, *Bidens tripartitus*, *Calystegia sepium*). Species of bordering

oak-ash-elm grove forest (*Circaea lutetiana*, *Galium odoratum*, *Geum urbanum*, *Hedera helix*, *Lamium galeobdolon*, *Pulmonaria officinalis*) or even hornbeam-oak forest (*Stellaria holostea*, *Ruscus aculeatus*) can be found sometimes in significant numbers, too. Protected species are *Neottia nidus-avis* and *Ruscus aculeatus*.

Non-natural types

There are some other types, which can occur inside of both natural communities, presumably as a result of some kind of forestry mismanagement, because their canopy is sparse (down to 45%), and consists often of only one species (usually *Quercus robur*).

Carex brizoides type

Canopy is very sparse, consists often only of *Quercus robur*. In the herb layer cover of *Carex brizoides* can reach 90%, pushing out other species.

Dactylis polygama type

It occurs also under sparse, one-species canopy, but on higher, drier parts: very characteristic on the elevations of the northern part of the area.

Solidago gigantea type

Solidago gigantea also occurs in masses under sparse oak or ash canopy. This highly argessive alien species competes out almost everything else, so no coenological relevés were made in *Solidago* type. *Solidago gigantea* occurs under non-natural tree stands too (mostly *Juglans nigra* and *Robinia pseudacacia*), but these monospecific stands are represented in the map by the tree species.

Plantations of exotic trees

Most important exotas in the study area are *Robinia pseudacacia* and *Juglans nigra*. Natural vegetation completely disappears from these places. Herb layer of these plantations: mostly *Solidago gigantea*, sometimes *Galium aparine* or *Chaerophyllum temulum*.

COMPARISON OF COMMUNITIES AND TYPES BY ECOLOGICAL INDICATOR VALUES

Spectra of ecological indicator values (Borhidi 1993, 1995) were analysed too, with special attention to transitional types (*Carex sylvatica* and *Galium odoratum* types of hardwood gallery forests). Calculation were made using only data of the herb layer, because this layer shows habitat characteristics more accurately and is not changed so radically by forestry activity.

Considering that 71% of the species pool of hornbeam-oak and hardwood gallery forests are occurring in both communities (Fig. 2), it is not surprising that analyses based on presence-absence data do not show significant differences between the two communities – except water spectra. At the same time, this indicates that the most important ecological factor separating the two communities is the water supply.

SPECTRA OF WATER INDICATOR VALUES

Peak of water spectra of hornbeam-oak forests (Fig. 3*a*) is at W5, descending evenly at W6 and W7. Peak of hardwood gallery forests (Fig. 3*c*) is at W5 too, but W6 and W7 categories contain only slightly fewer species. Transitional types (Fig. 3*b*) bear a resemblance to hornbeam-oak forests.

Water spectra based on cover data differentiate well among types belonging to the same community. Hornbeam-oak forest types (Fig. 4*a*): peak of higher-lying *Stellaria holostea* type is at W5, of lower-lying *Carex sylvatica* type is at W6. Hardwood gallery forests (Fig. 4*b, c*): W5 peak characterizes three types; the spectrum of *Galium odoratum* type is similar to that of hornbeam-oak forests: strongly descends at W6 and W7; in case of *Circaea lutetiana* and *Carex sylvatica* types W6 and W7 types also have significant values. *Galeobdolon luteum* type has its peak at W6, *Carex remota* type at W7.

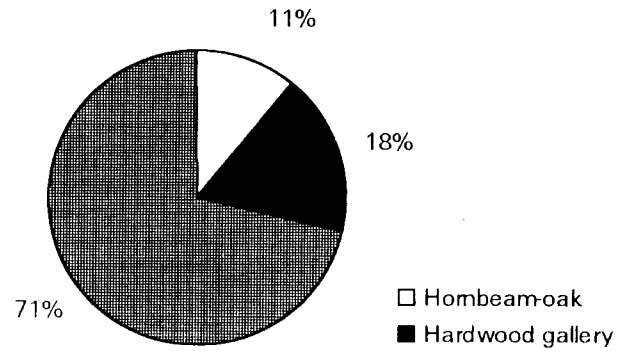

Fig. 2. Overlap between species pool of hornbeam-oak and hardwood gallery forests

NUTRIENT SPECTRA

Cover data based nutrient spectra of hornbeam-oak forests (Fig. 5*a*) show a distinct peak at W5. Spectra of hardwood gallery forests (Fig. 5*c*) are wider: categories of N5, N7 and N9 (and at *Carex remota* type W6, too) have about the

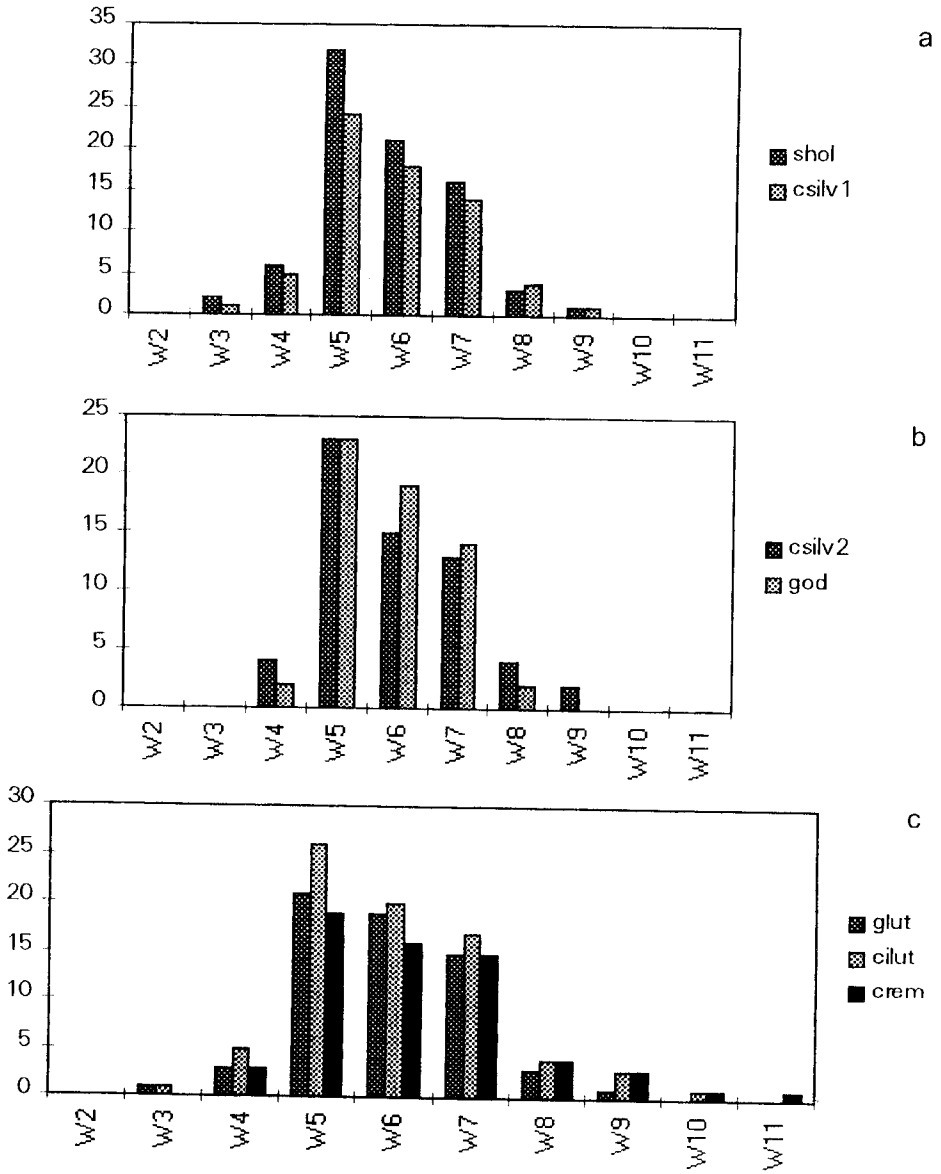

Fig. 3. Water spectra (by presence-absence data). *a*: hornbeam-oak forest types. *b*: transitional types. *c*: hardwood gallery forest types

same values. Transitional types (Fig. 5*b*) are really transitionary according to this indicator value: N5 dominates, but the importance of N6, N7 and N9 categories are higher than at hornbeam-oak forests.

CONTINENTALITY SPECTRA

Peak of continentality spectra of hornbeam-oak forests (Fig. 6*a*) is at K3, of hardwood gallery forests (Fig. 6*c*) is at K4, so they show more continental character. It can be explained by the fact that hardwood gallery forests often grow on allu-

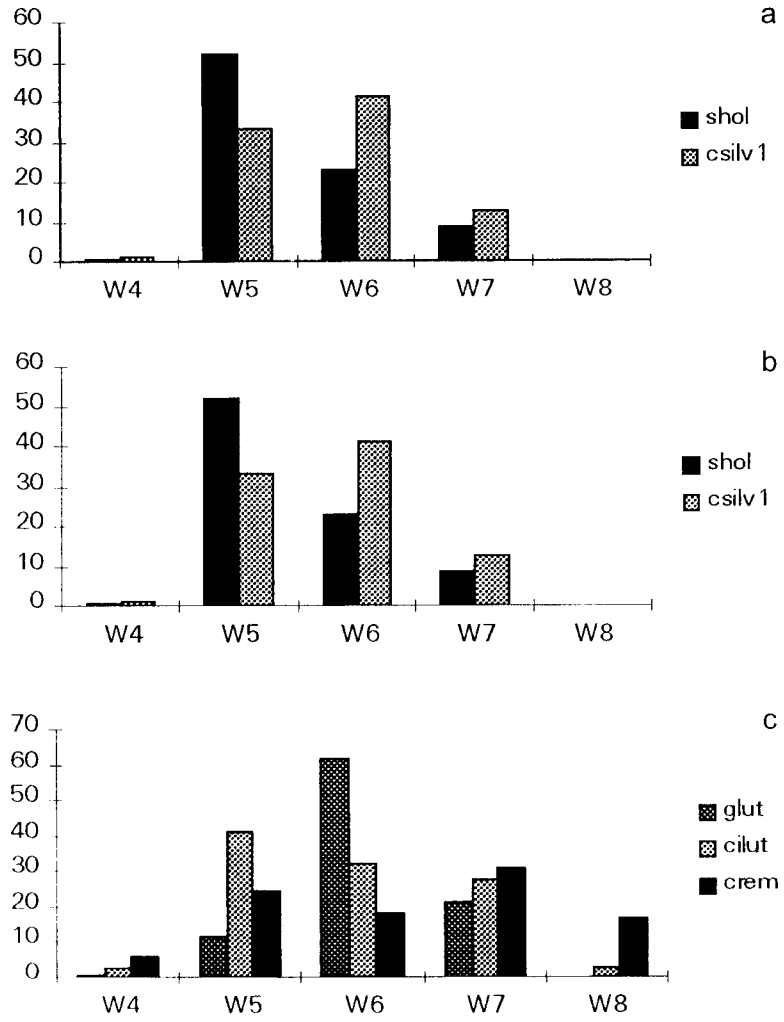

Fig. 4. Water spectra (by cover data). *a*: hornbeam-oak forest types. *b*: transitional types. *c*: hardwood gallery forest types

vial soil which has worse water storage capacity than the rusty brown forest soil of hornbeam-oak stands. Transitional types (Fig. 6*b*): *Carex sylvatica* type of hardwood gallery forests is similar to the latter; *Galium odoratum* type of hardwood gallery forests is more oceanic than hornbeam-oak forests: its peak is at K2.

LIGHT SPECTRA

Considering the above-mentioned ecological indicators, spectra of the two communities are pretty well distinguishable; spectra of different types of the same community are – more or less – similar. Light spectra are different: three spec-

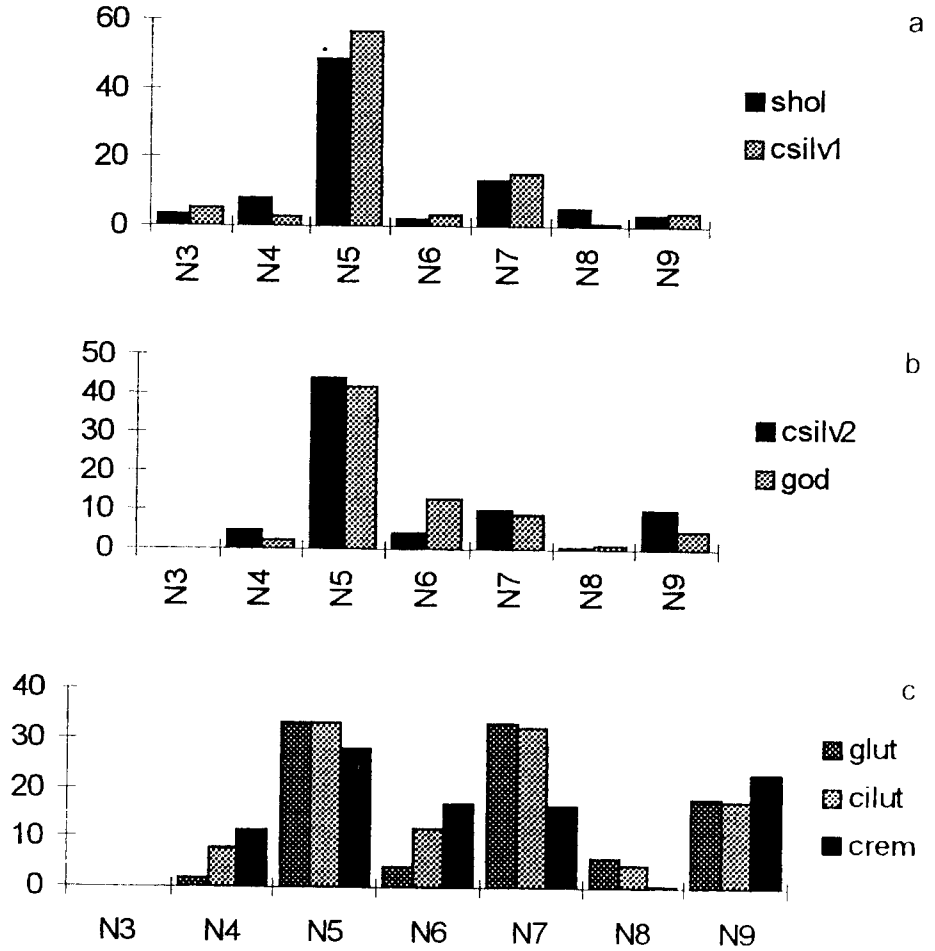

Fig. 5. Nutrient spectra (by cover data). *a*: hornbeam-oak forest types. *b*: transitional types. *c*: hardwood gallery forest types

trum-types can be distinguished here too, but they are not in accordance with the above-mentioned groups (hornbeam-oak forests, transitional types and hardwood gallery forests). It means that while separation of communities is determined first of all by water supply, type separation inside the communities are determined strongly by light conditions.

For the sake of easier interpretation light indicator categories were drawn together by pairs (species of light value above L6 can be neglected, because they occur with very low cover value); so we got the following spectra (Fig. 7).

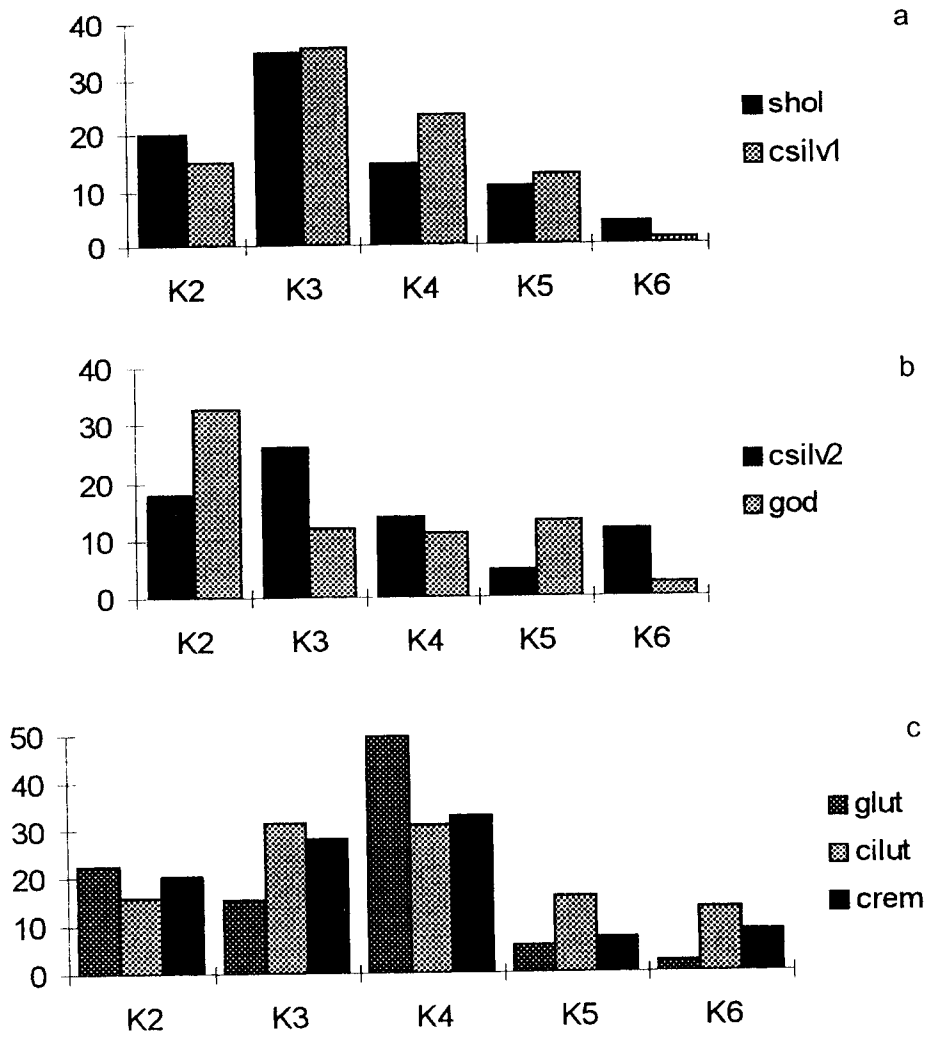

Fig. 6. Continentality spectra (by cover data). *a*: hornbeam-oak forest types. *b*: transitional types. *c*: hardwood gallery forest types

Three spectrum types can be distinguished. Medium relative light intensity (Fig. 7*a*) is characteristic of hornbeam-oak forests and of the *Galium odoratum* type of hardwood gallery forests: species of medium light values (L4–L5) represent 55–60%, extreme categories have a value of about 20%. High relative light intensity (Fig. 7*b*) characterizes the majority of hardwood gallery forest types (in accordance with the name-giving loose canopy of this association): the peak is in the middle (L4–L5 is 50–60%), but the value of "high light intensity" category (L6–L7) is higher: 30–45%, while dark indicator species represent only a minority of 4–11%. *Galeobdolon luteum* type has an extremely dark light conditions: value of L2–L3 category is 50% (Fig. 7*c*).

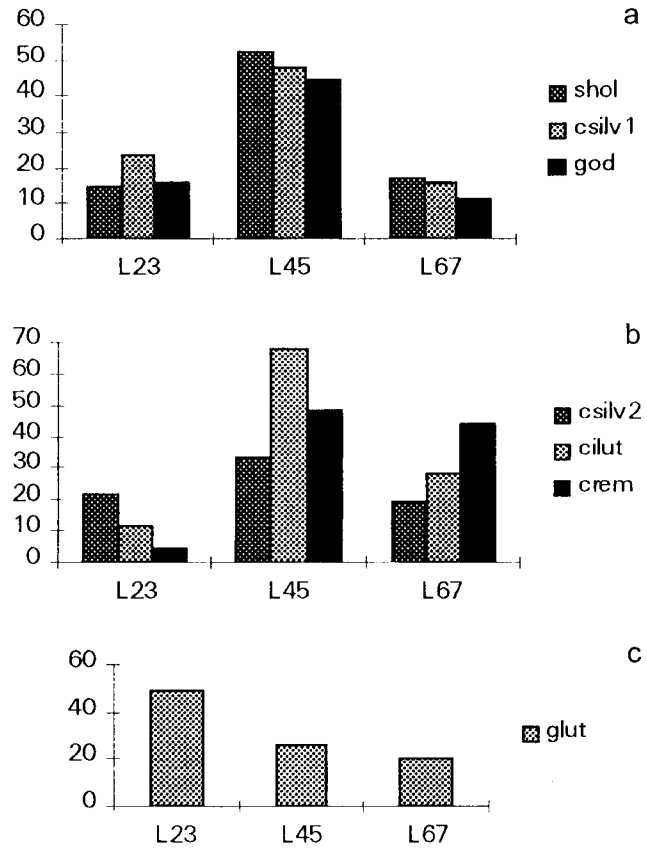

Fig. 7. Spectrum types (by cover data). *a*: medium relative light intensity. *b*: high relative light intensity. *c*: low relative light intensity

So the herb layer of the two types of hornbeam-oak forests can be characterized by species indicating medium relative light intensity; three of the five types of hardwood gallery forests have high relative light intensity, one of them has medium and one very dark. Hardwood gallery forests are far more widespread and heterogeneous in the study area than hornbeam-oak forests and more types can be differentiated – *e.g.* by relative light intensity values of the herb layer.

*

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Appendix 1

Scillo vindobonensi-Ulmetum Kevey 1996

	Carex sylvatica type			*Galium odoratum* type									*Galeobdolon luteum* type												*Circaea lutetiana* type										*Carex remota* type							
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
																			Canopy																							
Quercus robur		40		70	40	50	30	40	60	50	10	50	40	15	50	30	55	50		30	65	60		90		25	15	25	40	50	65	40	40	70	30	0.1		30	70	10	V	+–5
Fraxinus angustifolia	75	10	40				25		20	10	75		40	15	15	15	5	5	10	40		10	40	10	10	25	35	25	30	30	10	45			30	15	40		2	50	IV	1–5
Carpinus betulus		10	30	25	70	50	5	30				45		55		20	5	10	25		20	20	50		30		10	0.1			20		45	10	60						III	1–4
Acer campestre			2	15							5		1		0.1	3			10		5	5			60	3					3	10				5	25				II	+–4
Ulmus laevis						1	35	10	10		15						5	10			5			40									25	10			15		20		II	1–3
Ulmus minor			20				5				5							10								3	10	10	3		8	5					15				II	1–2
Acer tataricum													10				5									30			15					10		5					I	2–3
Cornus sanguinea								1							0.1			10						0.1												20			5		I	+–2
Crataegus monogyna																					5			10		3								10			15		5		I	1–2
Cerasus avium																			50																						I	4
Populus canescens																																						50			I	4
Quercus cerris																																10									I	2
Robinia pseudacacia																																1									I	1

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type												*Galeobdolon luteum* type												*Circaea lutetiana* type												*Carex remota* type									
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Pyrus pyraster																																															
																		Shrub layer																																
Cornus sanguinea	13	2		3			2			5	5		3		8	0.1	45	5		0.1	10	5		1			0.1	10		5	1		5	20	5	45	12	25	10		IV	+–3
Ulmus minor	5	2				3	1		1	30			3	0.1	0.1	3		5		0.1	4			20		0.1	0.1	10		0.1	1	1				0.1	8			4	III	+–3
Acer campestre	15	10		2					1			1	13	0.1	0.1	65	3	25		0.1	1	10	5			5		0.1	1	0.1	3		10		5						III	+–4
Carpinus betulus	0.1	2		2	10		2	10	40	45	40	1	3	0.1		0.1	3					15				1			1	1	1	5			5						III	+–3
Crataegus monogyna	5			3		1			8		5	1	1		5	0.1	6	0.1								0.1			0.1	1	3		10		2						III	+–2
Fraxinus angustifolia										1						0.1												0.1		0.1						1		30		1	I	+–3
Ligustrum vulgare	5													0.1	0.1	0.1		0.1													0.1				1						I	+–2
Rubus caesius															0.1	0.1										0.1	0.1			0.1	1										I	+–1
Ulmus laevis	3	14							10			1					0.1																							1		I	+–2
Acer tataricum								30					3													0.1		0.1							0.1						I	+–3
Corylus avellana				20									3		0.1					0.1																					I	+–2

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type												*Galeobdolon luteum* type												*Circaea lutetiana* type												*Carex remota* type									
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Crataegus oxyacantha													1					0.1														1	5								I	+–2
Sambucus nigra	3													0.1														0.1											5			I	+–2
Juglans nigra																																			5							I	2
Prunus spinosa																												•		0.1											I	+
Robinia pseudacacia													3																													I	1
Euonymus europaeus																																												
																		Herb layer																																
																		Alno-Ulmion																																
Fraxinus angustifolia		1		0.1	0.1	0.1	0.1		1	1	1	0.1				0.1	0.1	0.1		0.1					0.1	0.1	1	1	20	0.1	2	0.1		0.1	0.1	1	1	0.1	40	0.1	IV	+–3
Carex remota	1								1				0.1								1		0.1			0.1		0.1								5	10	10	5	10	II	+–2
Festuca gigantea												0.1														0.1	0.1	.1		1								0.1			I	+
Listera ovata																	1																									I	1
Ulmus laevis																	0.1																									I	+
Carex strigosa																						1																				I	+

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type												*Galeobdolon luteum* type												*Circaea lutetiana* type												*Carex remota* type													
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Fagetalia																																																			
Pulmonaria officinalis	0.1	0.1	0.1	5	20	0.1	10	20	0.1	5	0.1		10	0.1	1	0.1	0.1	3	5	0.1	20	10		1	10	5	1	5	1		10	3	15	15	1	1		10	10		V	+–2
Circaea lutetiana	0.1	1	0.1	5	0.1	0.1	1	1	1	1	0.1	1	2			15	10	0.1		3	2	0.1	0.1		10	15	5	10	10	10	3	10	10	10	3	0.1	10	0.1		V	+–2
Carex sylvatica	0.1	5	8	1	0.1	3		1	2		5	3		0.1	0.1	1	0.1	0.1	0.1		1	1	1		15	0.1	3	0.1	0.1		10	0.1	0.1	0.1	5	0.1		0.1	1	0.1	V	+–2
Galium odoratum		0.1	2	10	40	20	10	15	20	1	10	1	10			20	10	30		5	15				0.1	5	0.1	5	1	10	5	3	20	10	1	3	15	0.1	1		V	+–3
Carpinus betulus	1	1	1	0.1	0.1	8	5	0.1	3	0.1	5	8		0.1			0.1	0.1		5	0.1		2		1		1	0.1	1	0		0.1		1							IV	+–2
Stachys sylvatica	1		0.1	1		0.1		0.1	0.1		0.1	1		0.1	1	0				1					1	10	1	1		0.1	1	0		15	1	1	0	0.1		0.1	III	+–2
Galeobdolon luteum		5	5	3	1									15	40	40	25	50	10	30	20	10	15	15	30																	III	1–4
Rumex sanguineus		0.1	0.1		0.1									0.1	0.1	0.1		0.1		0.1		0.1				.1	0.1	0.1			0.1				0.1	0.1						II	+
Ficaria verna					10			30						15	15	35			5	10	30					10	15		1		1				20							II	1–3
Polygonatum multiflorum		0.1	0.1		0.1			0.1	0.1	0.1	0.1	0.1				0.1										0.1		0.1				0.1										II	+
Arum maculatum					1			1								0.1			0.1	0.1			1		1	.1				.1					.1							II	+–1
Asarum europaeum		1		10		3			2					1					0.1	0.1	1	5			1	.1				0.1												II	+–2

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type												*Galeobdolon luteum* type												*Circaea lutetiana* type												*Carex remota* type													
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Carpinion betuli																																																			
Cerasus avium			0.1			0.1																							0.1												I	+
Vinca minor																0.1																												I	+
Querco-Fagetea																																																			
Hedera helix		0.1	4	0	5	8	20	10	10	1	1	40	5	50	0.1	0.1	0.1	0.1	0.1	5	0.1		10	0.1		5	10	3	5	5	1	1	5	1	15	0.1	20	5	50	5	0.1	V	+–4
Acer campestre	3	15	8	0.1	3	5	3	1	1	3	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	5	1	3	10	10		10	0.1	15	0.1	10	0.1	80	3	3	0.1		1	0.1	0.1			V	+–5
Ulmus minor				0.1	0.1	3	3	5	2	0.1		10	2			0.1	0.1		0.1	0.1	1	1	2	1		15	.1	0.1	1	3	1	1	1	1	3						IV	+–2
Viola sylvestris		0.1		0.1	0.1	3		0.1	0.1	1		0.1	0.1	0.1		0.1	0.1	0.1	1	1	0.1				0.1	2	1	0.1	10	0.1	10	1	0.1	0.1	0.1	0.1						IV	+–2
Viola odorata						0.1	1	0.1	2	0.1	0.1	0.1	0.1	0.1		0.1	0.1	0.1		0.1		0.1	0.1	0.1	1	1	0.1	1	1	1	8			1	1								IV	+–2
Euonymus europaeus	0.1	0.1	0.1	0.1	0.1			0.1	0.1		1	0.1	0.1				0.1		0.1			0.1		0.1	0.1	.1			1	0.1	0.1	0.1	0.1	0.1	0.1	0.1					III	+–1
Galeopsis pubescens				0.1		0.1					0.1	0.1	0.1	0.1			0.1								0.1	0.1	0.1	5	0.1		0.1	0.1	0.1	0.1					0.1		III	+–2
Dactylis polygama		1	1			1				0.1	2		0.1	0.1	0.1		0.1									.1				8	0.1		1	2	0.1							II	+–2
Ligustrum vulgare	3		0.1	0.1	0.1	0.1		5	0.1				1	0.1	0.1									1	0.1					.1				2								II	+–2

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type										*Galeobdolon luteum* type											*Circaea lutetiana* type										*Carex remota* type											
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Anemone ranunculoides					.1			5							0.1				0.1	0.1	1	1				30	15				10					.1						II	+–3
Clematis vitalba						1							0.1																0.1					0.1	2	0.1					I	+–1
Dryopteris filix-mas																	0.1									.1								1		0.1			5		I	+–2
Lonicera caprifolium		0.1						1					0.1																												I	+–1
Moehringia trinervia																										1	1				1											I	1
Scrophularia nodosa				0.1									0.1					0.1																								I	+
Stellaria holostea													0.1												2	3																I	+–1
Fragaria vesca													0.1																		.1											I	+
Mycelis muralis		0.1																													1											I	1
Ruscus aculeatus				1	1																																				I	1
Convallaria majalis																																		40							I	3

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type										*Galeobdolon luteum* type											*Circaea lutetiana* type										*Carex remota* type											
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Corylus avellana				1																																					I	1
Epipactis helleborine												0.1																													I	+
Melica uniflora														0.1																												I	+
Polygonatum latifolium														0.1																												I	+
Quercus cerris		0.1																																							I	+
Acer tataricum	0.1	0.1		0.1													0.1								.1			5	0.1	0.1	0.1		0.1		1	1					II	+–1
Phragmitetea																																											
Iris pseudacorus		0.1																											0.1							0.1	0.1				I	+
Galium palustre							0.1											0.1																								I	+
Carex riparia																													0.1												I	+
Artemisietea																																										
Geranium robertianum	3		20		0.1	1	0.1	0.1	0.1	1	1	1	0.1	0.1	0.1	0.1	0.1	0.1	1	1			0.1		1	3	1	1	1	10	2	0.1		0.1	1	2		0.1	5	IV	+–2

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type												*Galeobdolon luteum* type												*Circaea lutetiana* type												*Carex remota* type													
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Chaerophyllum temulum	3	0.1	0.1	0.1		0.1	0.1		0.1	0.1			0.1	0.1	0.1	0.1			0.1	0.1						0.1	5	1	10		3	0.1			0.1	1	1	2			IV	+–2
Solidago gigantea			0.1												1														.1	0.1				0.1	0.1	0.1					I	+–1
Fallopia dumetorum																								0.1																		I	+
Chelidonium majus						0.1									0.1												0.1			1	0.1					0.1	0.1				I	+–1
Molinio-Arrhenatheretea																																																			
Campanula patula																	0.1											1									1				0.1	I	+–1
Lychnis flos-cuculi	1																																									I	1
Deschampsia caespitosa	0.1	0.1			.1						0.1													0.1									0.1								I	+
Epilobietea angustifolii																																																		
Geum urbanum	0.1		3	0.1	0.1	0.1			0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1		0.1		1		0.1		1	10	5	5	1	1	3	0.1	0.1	2	0.1	2	0.1	0.1		IV	+–2
Hypericum hirsutum				0.1																																					I	+

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type												*Galeobdolon luteum* type												*Circaea lutetiana* type												*Carex remota* type													
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Galeopsis speciosa						1				0.1	1																										0.1					I	+–1
Others																																																			
Brachypodium sylvaticum	3	0.1	1	0.1	0.1	1	1	0.1	0.1	1	0.1	1	0	0.1	0.1	0.1	3	0.1	0.1	1		3	1	1	0.1	0.1	1	0.1	1	0.1	1	20	1	1	0.1	1	3	1	0.1	0.1	V	+–2
Quercus robur	0.1		0.1	0.1		0.1	0.1	0.1	0.1	0.1	0.1	0.1			0.1	0.1					0.1		0.1				0.1	0.1		0.1							0.1	0.1	1	0	III	+–2
Crataegus monogyna			1	0	0.1		5	1	0.1		0.1		0.1						0.1	0.1						.1	0.1	0.1	0.1	0.1	3	0.1		2		0.1	0.1			III	++2
Lactuca serriola																			0.1																							I	+
Callitriche cophocarpa																																								0.1	I	+
Dryopteris carthusiana							0.1																			.1						0.1									I	+
Crataegus oxyacantha				0.1		0.1		0.1									0.1								0.1	0.1											0.1				I	+
Prunus spinosa																													0.1												I	+
Veronica montana	1	0	0.1	0.1								1			0.1											0.1																I	+–2
Vitis riparia		1	1																0.1								0.1														I	+–1

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type												*Galeobdolon luteum* type												*Circaea lutetiana* type												*Carex remota* type							
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Veronica officinalis		0.1												0.1																											I	+
Lemna minor																																								1	I	1
																			Indifferent																								
Rubus caesius	20	30	1	0.1	1	1	10	3	1	5	15	2	0.1	1	15	30	5	5		10	5	5	0.1	55	1	10	15	10	5	15	10	20	1	30	1	15	30	0.1	30		V	+–4
Cornus sanguinea	3	1	0.1	0.1	0.1		1	0.1	0.1	0.1	0.1	2	2		0.1		0.1				0.1	2		0.1		0.1	0.1	0.1	.1	10	.1	0.1	0.1	15	0.1	8	20	0.1		IV	+–2
Urtica dioica		5	8				5			0.1	3	0.1	0.1	0.1	5							1				10	5	10	1	1	3	50		0.1		15	3	1		III	+–4
Galium aparine	0.1	0.1		0.1			0.1							5	0.1	0.1		0.1	30	0.1	0.1					10	5	5	1	0.1	0.1	0.1				0.1		0.1		III	+–3
Alliaria petiolata		0.1	0.1	0.1		1	0.1				0.1	0.1	0.1	0.1			0.1	0.1		1					0.1	.1			0.1	0.1					0.1		0.1			III	+–1
Ajuga reptans		1		1	0.1	1		0.1						0.1			0.1		0.1				0.1			.1	.1				0.1	0.1	0.1		0.1	0.1				III	+–1
Carex divulsa			1	1	0.1	0.1	0.1	1			20	3																			0.1	0.1	0.1	0.1			3		0.1		II	+–2
Lamium maculatum					.1			.1					5	0.1	0.1	0.1			0.1							5					10			0.1	0.1			1	1	II	+–2
Sambucus nigra								0.1					0.1		0.1								0.1		0.1	.1		1	2		.1			0.1	0.1	1					II	+–1
Glechoma hederacea												15			0.1											5	15			0.1	.1			0.1		15	5		5		II	+–2
Stenactis annua				0.1			0.1							0.1	0.1										0.1	.1				0.1		0.1							10	II	+–2

Appendix 1 cont.

	Carex sylvatica type	*Galium odoratum* type												*Galeobdolon luteum* type												*Circaea lutetiana* type												*Carex remota* type							
Plot number	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	33	34	35	36	37	38	39	40	K	A–D
Lysimachia nummularia																	0.1										15					0.1		1		10	0.1		3	5	II	+–2
Veronica chamaedrys			0.1		0.1			0.1								0.1	0.1				0.1					0.1	0.1			0.1			0.1		0.1	1					II	+
Athyrium filix-femina								0.1																								0.1		1		1			5		I	+–2
Stellaria media																										10		1	15	0.1								0.1			I	+–2
Symphytum officinale		0.1																											1		.1										I	+–1
Ambrosia artemisifolia																																			0.1						I	+
Lapsana communis																																			0.1						I	+
Lycopus europaeus																														0.1											I	+
Prunella vulgaris																																			0.1						I	+
Robinia pseudacacia													0.1																												I	+
Vicia sepium																		0.1																							I	+
Allium scorodoprasum																									.1	.1				15											I	+–2

Appendix 2

Fraxino pannonicae-Carpinetum Soó et Borhidi in Soó 1962

	Carex sylvatica type															*Stellaria holostea* type										
Plot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	K	A–D
Canopy																										
Carpinus betulus			80	20	40	50	80	95	40	50	30	20	60	80	90	5		25	35	60	40	30	50	75	V	2–5
Quercus robur	80	60		60	60	40	5		80	30	60	60	20	40	0.1	35	35	50	5	50	60	40	50	5	V	1–5
Fraxinus angustifolia				10					10			3			0.1	0.1			20					10	II	+–2
Ulmus minor						1						8	0.1	20							5	5			II	+–2
Acer campestre			1						10									0.1	35	10				5	II	+–3
Cornus sanguinea					5																				I	2
Pyrus pyraster												3						5				1			I	1–2
Tilia platyphyllos																	35								I	3
Shrub layer																										
Carpinus betulus	25	10	35	10	0.1	1	1			15	1	0.1	30		5	0.1	0.1				1	10			IV	+–3
Cornus sanguinea	10	8		1	5				15					0.1	0.1						12	10			II	++2
Crataegus monogyna		0.1							1		1		0.1	0.1	3		15				1			1	II	+–2
Acer campestre	15	0.1		1		1									25	35	0.1					5			II	+–2
Ligustrum vulgare	5	0.1			10	1						0.1		0.1	0.1		0.1								II	+–2
Crataegus oxyacantha	10	0.1		0.1						1	2				0.1						1				II	+–2
Ulmus minor		0.1							1		3	3		0.1								10			II	+–2
Acer tataricum		0.1									2	4			5							5			I	+–2
Rubus caesius												0.1			0.1	0.1									I	+
Corylus avellana		0.1							2																I	+–1
Fraxinus angustifolia																	0.1					0.1			I	+
Euonymus europaeus	0.1																								I	+

Appendix 2 cont.

	Carex sylvatica type															*Stellaria holostea* type										
Plot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	K	A–D
Frangula alnus												3													I	++1
Pyrus pyraster																	0.1								I	+
Robinia pseudacacia																5									I	2
Rosa arvensis																0.1									I	+
Sambucus nigra																5									I	2
Tilia platyphyllos																	15								I	2
Prunus avium												3													I	1
Herb layer																										
Aremonio-Fagion																										
Polystichum setiferum																							0.1		I	+
Carpinion betuli																										
Cerasus avium		0.1	0.1		1																	0.1		0.1	II	+–2
Fagetalia																										
Carex sylvatica	35	0.1	10	15	8	5	8	40	15	30	20	15	0.1		3	1		0.1	10	1	1	1		30	V	+–3
Carpinus betulus		0.1	20	1	0.1	15	5	15	0.1	30	5	0.1	0.1	0.1				1	0.1	3	2	0.1	25	0.1	V	3
Pulmonaria officinalis	1	0.1	1	5		1	1		1		5	10	0.1	0.1	0.1	0.1		1	1		0.1	2	0.1	0.1	IV	+–2
Galium odoratum	5	0.1	5	5	0.1	0.1	5	5	5	1	15	10		10	0.1				30		20	10		15	IV	+–3
Rumex sanguineus		0.1	0.1	0.1	0.1	0.1				0.1		0.1	0.1		0.1		0.1	0.1	0.1			0.1	0.1		III	+
Rosa arvensis			0.1	0.1		0.1				0.1	0.1	0.1	0.1		0.1			1	0.1		1	0.1		0.1	III	+–1
Euphorbia amygdaloides			1				0.1	0.1	1		0.1	0.1			0.1	0.1			0.1	0.1	0.1			0.1	III	+–1
Circaea lutetiana	0.1		0.1	0.1	15	3	3					1	0.1			0.1	5							0.1	III	+–2
Lamium galeobdolon				5		0.1			0.1	0.1		3			1			1	3	0.1	1			1	III	+–2
Polygonatum multiflorum	0.1			0.1		0.1			0.1			1	0.1			1	0.1	0.1	0.1					0.1	III	+–1

Appendix 2 cont.

	Carex sylvatica type											*Stellaria holostea* type														
Plot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	K	A–D
Ficaria verna	25	5	35	0.1	20							0.1			30		45	0.1	30						III	+–3
Carex brizoides	0.1	3	2		0.1							1	0.1		10		5	5							II	+–2
Cardamine impatiens				0.1	0.1	0.1	1					0.1		0.1					1						II	+–1
Stachys sylvatica			10	10			1					1				0.1			0.1					0.1	II	+–2
Asarum europaeum												3		0.1					1	0.1		1		2	II	+–1
Dentaria bulbifera													0.1	0.1	0.1		0.1		0.1					0.1	II	+
Arum maculatum	0.1											1	0.1				0.1		0.1						II	+
Galanthus nivalis					0.1									0.1	0.1										I	+
Corydalis cava																	0.1		0.1						I	+
Gagea lutea					0.1							1													I	+–1
Milium effusum		0.1													0.1										I	+
Aegopodium podagraria			0.1																						I	+
Allium ursinum																			5						I	2
Paris quadrifolia																	1								I	1
	Alno-Ulmion																									
Fraxinus angustifolia				0.1		0.1		0.1	0.1					0.1	0.1	0.1	0.1	0.1	0.1	0.1		1		0.1	III	+–1
Festuca gigantea		0.1	0.1											0.1											I	+
Carex remota						0.1						0.1													I	+
	Querco-Fagea																									
Acer campestre	0.1	0.1	10	0.1		0.1	0.1	2	0.1	0.1	0.1	5	3	0.1	20	0.1	1	0.1	5	15	0.1		0.1	5	V	+–2
Hedera helix	5	0.1	3	0.1		30	20	3	20	3	20	1	0.1		0.1	30	1	0.1	10	0.1	5	5	10	15	V	+–3
Dactylis polygama	25	40	10	0.1	1	0.1	1	0.1				1	0.1		1	0.1	15	5	3	5	0.1		30	2	IV	+–3
Euonymus europaeus	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		0.1	0.1	0.1		0.1	0.1		0.1			IV	+

Appendix 2 cont.

	Carex sylvatica type											*Stellaria holostea* type														
Plot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	K	A–D
Stellaria holostea		1		0.1				2			10	3	15	1	20	15	15	40	15	1	35	15	3	5	IV	+–3
Ligustrum vulgare	0.1		0.1	0.1	15	1	0.1		0.1	0.1	1	0.1		0.1	0.1		0.1	0.1		1	1		0.1		IV	+–1
Viola sylvestris			0.1	1	0.1		3	1	2	0.1		0.1			0.1	0.1	1	1	1	0.1	0.1	1		0.1	IV	+–1
Viola odorata		0.1	0.1	1			0.1	0.1				0.1	0.1			0.1			0.1	0.1		0.1		0.1	III	+–1
Ulmus minor			0.1	1		0.1			0.1			0.1	0.1						0.1	1		0.1	0.1	0.1	III	+–1
Fragaria vesca		0.1	1			0.1		0.1	1	0.1												0.1	0.1	1	II	+–1
Ruscus aculeatus				1					1		1	0.1		0.1	0.1				0.1					1	II	+–1
Anemone ranunculoides	20				3							3		0.1	0.1		0.1								II	+–2
Dryopteris filix-mas		0.1			0.1			0.1											0.1			1			II	+
Cephalanthera longifolia									0.1	0.1								0.1				0.1			I	+
Pyrus pyraster			0.1	0.1		0.1									0.1										I	+
Galeopsis pubescens													0.1			1		0.1							I	+–1
Scrophularia nodosa								0.1															0.1	0.1	I	+
Clematis vitalba																				1				0.1	I	+–1
Convallaria majalis																				10				20	I	2–3
Corylus avellana		0.1							0.1																I	+
Lonicera caprifolium												0.1								0.1					I	+
Melica uniflora															20				20						I	2
Moehringia trinervia															0.1				0.1						I	+
Calamintha clinopodium																							1		I	1
Epipactis helleborine																							0.1		I	+
Melampyrum nemorosum																							1		I	1
Mycelis muralis															0.1										I	+

Appendix 2 cont.

	Carex sylvatica type															*Stellaria holostea* type											
Plot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	K	A–D
Platanthera bifolia																					0.1				I	+
Tilia platyphyllos																	1								I	1
Hieracium racemosum																								0.1	I	+
Acer tataricum	0.1					0.1	0.1							0.1		1		0.1		0.1				0.1	II	+–1
Artemisietea																										
Solidago gigantea		0.1			0.1	0.1	0.1			0.1							1	0.1				0.1	0.1	0.1	III	+–1
Geranium robertianum			0.1	0.1	0.1		1		0.1			0.1	0.1		3	1	0.1	0.1	1				0.1	0.1	III	+–1
Fallopia dumetorum												0.1													I	+
Chaerophyllum temulum		0.1	0.1									30	1			0.1			3	0.1			1		II	+–3
Molinio-Arrhenatheretea																										
Campanula patula															0.1	1									I	+
Lychnis flos-cuculi		0.1		0.11										0.1											I	+
Deschampsia caespitosa			0.1					35	10	2	10								0.1			25	15		II	+–3
Epilobietea angustifolii																										
Geum urbanum	0.1	2	3	1		0.1	1					1			0.1	0.1	1		1			0.1		0.1	III	+–1
Hypericum hirsutum	0.1		0.1																						I	+
Galeopsis speciosa							1																		I	1
Rhamno-Prunetea																										
Crataegus monogyna			0.1	0.1		0.1	0.1	0.1		1		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			0.1	0.1	IV	+–1
Prunus spinosa												0.1					0.1	0.1		0.1					I	+
Crataegus oxyacantha																			0.1		0.1				I	+

Appendix 2 cont.

	Carex sylvatica type															*Stellaria holostea* type										
Plot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				21		
Others																										
Iris pseudacorus	0.1																								I	+
Galium palustre			0.1																1						I	+–1
Lamium purpureum													0.1												I	+
Quercus robur			0.1	0.1		0.1	0.1	0.1	0.1	1	0.1	0.1			0.1		0.1	0.1		0.1	0.1	0.1	0.1		IV	+
Frangula alnus																						0.1		0.1	I	+
Indifferent																										
Rubus caesius	1	3	0.1	1	15	0.1	0.1	0.1	0.1	5	0.1	10	20	0.1	1	1	1	0.1	3	5	0.1	0.1	1	0.1	V	+–2
Brachypodium sylvaticum	0.1	50	1	0.1		0.1	0.1	0.1	1	0.1	1	0.1	0.1	0.1	0.1	1	0.1		1	1	0.1	1	1	3	V	+–4
Cornus sanguinea	1		0.1	0.1	0.1	0.1	0.1	0.1	5	2		0.1		0.1				1		0.1	1	0.1		1	IV	+–2
Ajuga reptans		10			0.1	0.1	1	3				0.1	0.1	1	0.1						35	1	1	0.1	III	+–3
Galium aparine	0.1		0.1	1	15		0.1						0.1		0.1	0.1	0.1	0.1							III	+–2
Lysimachia nummularia		0.1	0.1			0.1		0.1	5				0.1				0.1	0.1		0.1		0.1			III	+–2
Stenactis annua							0.1		1	0.1	0.1	0.1	0.1			1		0.1		0.1			0.1		III	+–1
Veronica chamaedrys		3	2	0.1			0.1								0.1		1	1		0.1		0.1			II	+–1
Alliaria petiolata		0.1	0.1	0.1											0.1	3	0.1		1						II	+–1
Stellaria media			0.1	0.1	0.1		1						40		0.1	15									II	+–3
Carex divulsa				1	0.1		8										5	0.1					0.1		II	+–2
Glechoma hederacea	0.1			5				3				0.1				0.1		0.1							II	+–1
Lamium maculatum			0.1	0.1	0.1				0.1			1						1							II	+–1
Sambucus nigra	0.1						1										0.1	0.1	0.1						II	+–1
Symphytum officinale		0.1			0.1				1	0.1														0.1	II	+–1
Juncus effusus		0.1				0.1				0.1								0.1							I	+

Appendix 3
Paridi quadrifoliae-Alnetum Kevey 1996

	1	2	3	4	5	K	A–D
Canopy							
Fraxinus angustifolia	40	5	55	5	90	5	2–5
Alnus glutinosa		65	10	40		3	2–4
Ulmus laevis	1	10	5			3	1–2
Ulmus minor	20			1		2	1–2
Acer campestre				1		1	1
Acer platanoides		1				1	1
Populus alba	50					1	4
Shrub layer							
Acer campestre	75	5			1	3	1–5
Cornus sanguinea	1	15			2	3	1–2
Ulmus minor	1	1		0.1		3	+–1
Carpinus betulus	1	1				2	1
Crataegus monogyna	1				1	2	1
Fraxinus angustifolia		1		1		2	1
Acer platanoides		1				1	1
Acer tataricum	3					1	1
Corylus avellana	1					1	1
Crataegus oxyacantha	1					1	1
Sambucus nigra		1				1	1
Ulmus laevis		5				1	2
Herb layer							
Total cover (%)	43.6	27.2	28.4	74.2	74.8		
Alno-Ulmion							
Carex remota		0.1	5		0.1	3	+–2
Fraxinus angustifolia			1	0.1	1	3	+–1
Carex strigosa			0.1			1	+
Festuca gigantea			0.1			1	+
Fagetalia							
Circaea lutetiana	1	10	1		10	4	1–2
Galium odoratum	10	0.1	2			3	+–2
Asarum europaeum	1	10				2	1–2
Pulmonaria officinalis	1	0.1				2	+–1
Rumex sanguineus			0.1			1	+
Carex sylvatica	0.1					1	+
Neottia nidus-avis	0.1					1	+
Paris quadrifolia	1					1	1

Appendix 2 cont.

	Carex sylvatica type																					*Stellaria holostea* type													K	A–D
Plot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21																
Urtica dioica																																				I	+–1
Vinceloxicum hirundinaria																																				I	+–2
Robinia pseudacacia																																				I	+
Lapsana communis																																				I	+
Taraxacum officinale																																				I	+
Vicia sepium																																				I	+

Localities 1–24: Vajszló forest

Appendix 3 cont.

	1	2	3	4	5	K	A–D
Stachys sylvatica	1					1	1
Ficaria verna			0.1			1	+
Lamium galeobdolon	10					1	1
Carpinus betulus	0.1					1	+
Dentaria bulbifera	0.1					1	+
Impatiens noli-tangere			1			1	1
		Querco-Fagetea					
Hedera helix	1	0.1	0.1		1	4	+–1
Acer campestre	1	0.1	0.1		0.1	4	+–1
Ulmus minor	0.1		0.1	1		3	+–1
Scrophularia nodosa			0.1		0.1	2	+
Stellaria holostea	1	0.1				2	+–1
Ruscus aculeatus	1	0.1				2	+–1
Melica uniflora	10					1	2
Ligustrum vulgare	0.1					1	+
Euonymus europaeus		0.1				1	+
Lonicera caprifolium	1					1	1
		Artemisietea					
Solidago gigantea			0.1			1	+
Geranium robertianum		0.1				1	+
Calystegia sepium				1		1	1
Chaerophyllum temulum	0.1	0.1				2	+
Chelidonium majus		0.1				1	+
		Phragmitetea					
Alisma plantago-aquatica			0.1			1	+
Iris pseudacorus		0.1	0.1	0.1	2	4	+–1
Oenanthe aquatica			0.1				+
Carex riparia		0.1		10	15	3	+–3
Galium palustre					0.1	1	+
		Others					
Bidens tripartitus				50		1	4
Cardamine pratensis			0.1			1	+
Geum urbanum	0.1	0.1	0.1			3	+
Quercus robur	0.1				0.1	2	+
Acer tataricum	1	0.1				2	+–1
Crataegus monogyna	0.1	0.1				2	+

Appendix 3 cont.

	1	2	3	4	5	K	A–D
			Indifferent				
Parthenocissus quinquefolia					5	1	1
Rubus caesius	0.1	0.1	0.1	10	20	5	1–2
Lysimachia nummularia	0.1	0.1	0.1		10	4	1–2
Urtica dioica	0.1	0.1	0.1		0.1	4	1
Sambucus nigra	0.1	0.1	0.1			3	1
Galium aparine	0.1	0.1	1			3	1–1
Glechoma hederacea			1		5	2	1–2
Ranunculus repens			3		0.1	2	1–1
Cornus sanguinea			0.1		0.1	2	1
Festuca arundinacea		0.1		2		2	1–1
Brachypodium sylvaticum	0.1		0.1			2	1
Stellaria media			1		5	2	1–2
Mentha aquatica			0.1			1	1
Symphytum officinale			0.1			1	1
Lamium maculatum	1					1	1
Caltha palustris			10			1	2
Lysimachia vulgaris			0.1			1	1
Agrostis stolonifera		5	0.1			2	1–2

Locations: 1, 2, 4: Páprád (02.06.1995, 08.06.1995, 27.06.1996); 3, 5: Kisszentmárton (21.05.1996, 05.08.1996)

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