A revised classification of Ukrainian forests of the order Fagetalia sylvaticae

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Abstract

The paper presents a new classification and informations about associations of the order Fagetalia sylvaticae on the territory of Ukraine. The order includes 9 alliances (Asperulo-Fagion, Cephalanthero-Fagion, Carpinion betuli, Tilio platyphylli-Acerion pseudoplatani, Dentario quinquefolii-Fagion, Paeonio dauricae-Quercion petraeae, Querco roboris-Tilion cordatae, Scillo sibericae-Quercion roboris, Alnion incanae) and 31 syntaxa of the level of association. The synoptic table contains data on constancy of species in all associations with constancy more than 10%. Maps of distribution of these associations in Ukraine are given.

Zusammenfassung: Überarbeitete Klassifikation ukrainischer Wälder der Ordnung Fagetalia sylvaticae

Die Arbeit präsentiert eine neue Klassifikation und Informationen über die Assoziationen der Ordnung Fagetalia sylvaticae in der Ukraine. Die Ordnung enthält 9 Verbände (Asperulo-Fagion, Cephalanthero-Fagion, Carpinion betuli, Tilio platyphylli-Acerion pseudoplatani, Dentario quinquefolii-Fagion, Paeonio dauricae-Quercion petraeae, Querco robori-Tilion cordatae, Scillo sibericae-Quercion roboris, Alnion incanae) und 31 Syntaxa auf Assoziationsebene. Die Übersichtstabelle enthält alle Arten der Assoziationen mit Stetigkeitswerten über 10 %. Außerdem sind Verbreitungskarten der Assoziationen in der Ukraine eingefügt.

Keywords: broadleaved deciduous forests, vegetation classification, distribution maps, eastern Europe.

1. Introduction

For many years the diversity of Ukrainian vegetation was studied using the dominant approach for classifying the plant communities. The first publication about the broadleaved forests of Ukraine using the floristic approach of Braun-Blanquet is probably the book by W. Szafer "Las i step na zachodniem Podolu" (1935) ("Forest and steppe in West Podolia", in Polish). In 1941, Y.D. Kleopov distinguished a number of regional associations of the broadleaved forests in his dissertation "Analysis of the flora of broadleaved forests of the European part of the USSR". In the period between 1982 and 2008, more than 30 articles and monographs have been published where *Fagetalia sylvaticae* forests of Ukraine were considered on the basis of the floristic classification. The full classification of Ukrainian forests of the order, documented with vegetation tables containing 802 relevés are presented in the monography by V.A. Onyshchenko (ONYSHCHENKO 2009). The present article is a more compact presentation of these data on *Fagetalia sylvaticae* forests in Ukraine at the level of associations.

2. Study area

The area of Ukraine comprises four geobotanical regions: European deciduous forest region, Eurosiberian forest-steppe region, Eurasian steppe region, and Submediterranean forest region. There are two mountain systems: the Carpathians (in the European deciduous forest region) and the Crimean Mountains (in the Submediterranean forest region). Forests occupy about 15.7% (9.5 millions ha) of the total area of Ukraine. The largest areas are covered by pine (33.1%, mainly *Pinus sylvestris*), oak (24.2%, mainly *Quercus robur*), spruce (7.6%) and beech (7.3%) forests. About 30% of Ukrainian forests belong to the order *Fagetalia sylvaticae* (class *Querco-Fagetea*).

The mean temperature of the warmest month varies between +17 °C (in mountains +12 °C) and +23 °C, the mean temperature of the coldest month between -8 °C and +4 °C (LIPINSKY et al. 2003). The mean annual precipitation is between 350 and 750 mm within the flatland portion of Ukraine, in the Carpathians it is up to 1600 mm. The heterogeneity of the climate creates opportunities for a rather high level of geographic variety of the forest vegetation. In the southern and middle strips of the steppe zone, no forests of the order *Fagetalia sylvaticae* are found.

3. Materials and Methods

About 2000 relevés were used for the analysis of the diversity and distribution of the syntaxa. Constancies of species were calculated using 984 relevés of high quality (mainly double spring + summer relevés). Plot size varies from 100 m² to 2500 m², usually 400–900 m².

The concept of the order Fagetalia sylvaticae is rather traditional. Acidophilous beech forests (Luzulo-Fagion) and eutrophic fir forests (Galio-Abietion) are not included. Zonal associations are treated as large regional variants of alliances. All subassociations are edaphically determined. The presented classification is the result of a complex approach, making a distinction between geographical and local variability, distinguishing homological series of syntaxa, and making use of the estimation of similarities between syntaxa. This study is not based on any kind of numerical classifications with fixed parameters.

In the synoptic table, species are evaluated using the algorithm for determination of differential taxa (TSIRIPIDIS et al. 2009). Constancies of species of the associations were calculated as means of constancies of these species in subassociations (when subassociations are distinguished). The nomenclature of species follows the nomenclatural checklist of vascular plants of Ukraine (MOSYAKIN & FEDORONCHUK 1999).

4. Classification and characteristics of syntaxa

The data on constancy of vascular plant species are presented in a synoptic table (table 1). Nine alliances have been distinguished, including 31 associations all together.

4.1. Asperulo-Fagion Tx. 1955

Typical central European beech forests on neutral soils. Distribution of all associations of this alliance is shown on Fig. 1.

4.1.1. Eu-Fagenion Oberdorfer 1957

The suballiance is represented by one association.

Athyrio distentifolii-Fagetum Willner 2002

(Aceri-Fagetum Rübel 1930 ex J. et M.Bartsch 1940).

Main positive differential species versus other Ukrainian associations of the alliance are *Geranium sylvaticum* and *Phyteuma spicatum*. The association occurs in the upper part of the forest belt. In Ukraine, it is only known from the extreme western part of the Carpathians.

4.1.2. Symphyto cordati-Fagenion Vida 1963

Three associations belong to this suballiance, which is restricted to the Carpathians and adjacent areas. Main differential species are *Dentaria glandulosa* and *Rubus hirtus*.

Symphyto cordati-Fagetum Vida 1959

Typical Carpathian beech and fir-beech forests at altitudes (300) 500-1200 m.

Synonym: *Dentario glandulosae-Fagetum* W. Matuszkiewicz 1964 ex Guzikowa et Korna 1968 p.p. (mountain form).

Stellario holosteae-Fagetum Onyshchenko 2008

Beech forests of the Podolian upland (200-450 m).

Carpino-Fagetum Pauca 1941

This association occurs in the Carpathians at lower altitudes than the *Symphyto cordati-Fagetum* and on the Precarpathian plain in the Chernivtsi region. Most of its area is situated in Romania.

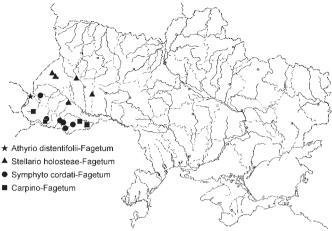


Fig. 1: Distribution of associations of the Asperulo-Fagion in Ukraine.

Abb. 1: Verteilung der Assoziationen des Asperulo-Fagion in der Ukraine.

4.2. Cephalanthero-Fagion Tx. 1955

Central European beech forests on calcareous soils. The distribution of the associations of this alliance in Ukraine is shown in Fig. 2.

Euonymo verrucosae-Fagetum Onyshchenko 2008

Eastern association of lowland calciphilous beech forests. In other countries it is described as Fagus sylvatica- Cruciata glabra community or subassociation Carici-Fagetum convallarietosum Michalik 1972.

Seseli libanotidis-Fagetum Onyshchenko 2008 ass. prov.

Rare Carpathian association, which stands close to the Taxo-Fagetum Etter 1947.

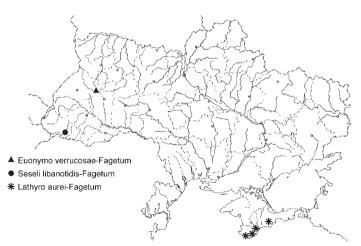


Fig. 2: Distribution of the associations of the Cephalanthero-Fagion and Dentario quinquefoliae-Fagion in Ukraine

Abb. 2: Verteilung der Assoziationen des Cephalanthero-Fagion und Dentario quinquefoliae-Fagion in der Ukraine.

4.3. Dentario quinquefoliae-Fagion sylvaticae Didukh 1996

Crimean beech forests (Fig. 2).

Lathyro aurei-Fagetum Borhidi 1962

The main association of the Crimean Mountains at altitudes ranging from (600) 700 to 1200 m.

4.4. Carpinion betuli Issler 1931

This alliance includes most Europaean oak-hormbeam forests. The Crimean oak and hornbeam forests belong to the alliance *Paeonio dauricae-Quercion* (see 4.7).

Tilio-Carpinetum Traczyk 1962

Northeastern association of the alliance. It includes oak-hornbeam forests of the northern and western parts of Ukraine (Fig. 3). Besides it occurs in Poland, Belarus, Czech, Slovakia and Lithuania. The geographical variant from the Carpathians and adjacent areas differs by high constancy values of *Euphorbia amygdaloides*, *Fagus sylvatica*, and *Rubus hirtus*.

Circaeo-Carpinetum Borhidi 2003

(Querco roboris-Carpinetum Soó et Pócs 1957)

This association is found on the plains of Hungary and adjacent countries. In Ukraine, it occurs on the Transcarpathian lowland. Besides Transcarpatian forests with *Fraxinus pannonica*, a non-typical variant without this species was found in Precarpathian region. The main dominants in the tree layer are *Quercus robur* and *Carpinus betulus*.

Carici pilosae-Carpinetum Neuhäusl et Neuhäuslová 1964

(Querco petraeae-Carpinetum Soó et Pócs 1957)

This association occurs in the lower belt (100-500 m) of the Carpathians. In Ukraine, the association is found only on the southwestern macroslope (Transcarpathia). Probably it can be found in the Chernivtsi region as well. Outside Ukraine it occurs in Czech, Slovakia, Romania, Hungary. The main dominants in the tree layer are *Quercus petraea* and *Carpinus betulus*.

Isopyro thalictroidis-Carpinetum Onyshchenko 1998

Podolian oak-hornbeam forests (western part of the forest-steppe region and adjacent areas of the deciduous forests region). This is the most species-rich association of the alliance in Ukraine.

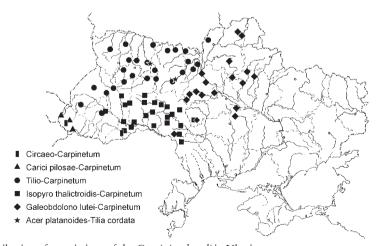


Fig. 3: Distribution of associations of the Carpinion betuli in Ukraine.

Abb. 3: Verteilung der Assoziationen des Carpinion betuli in der Ukraine.

Galeobdolono lutei-Carpinetum Shevchyk et al. 1996 em. Onyshchenko et Sidenko 2002 Oak-hornbeam forests of the Dnipro forest-steppe region. This association includes the subassociation G.-C. melampyretosum nemorosi Vorobyov et al. 2008. It is rich in light-demanding species (transitional to Quercetalia pubescentis) and may be treated as a separate association (Carici michelii-Carpinetum Vorobyov et al. 2008). TWINSPAN groups this community together with the homologous Isopyro thalictroidis-Carpinetum brachypodietosum sylvaticae Onyshchenko 2009. Another cluster is formed by more typical subassociations of the Isopyro thalictroidis-Carpinetum and the Galeobdolono lutei-Carpinetum.

Acer platanoides-Tilia cordata com. Jutrzenka-Trzebiatowski 1993

(Poo nemoralis-Tilietum cordatae Yakushenko 2004 nom. inv.)

Rare community of steep granite slopes of valleys in Zhytomyr Polissia. Outside Ukraine, more localities are known from Poland.

4.5. Querco roboris-Tilion cordatae Solomeshch et Laivins 1993

Mesophilous forests of order *Fagetalia sylvaticae* in the deciduous forest region and in the coniferous forest region of eastern Europe (Fig. 4).

Mercurialo perennis-Quercetum roboris Bulokhov et Solomeshch 2003

Mainly oak and lime forests. The association occurs in the northern part of Ukraine, as well as in the Bryansk and Kaluga regions of Russia.

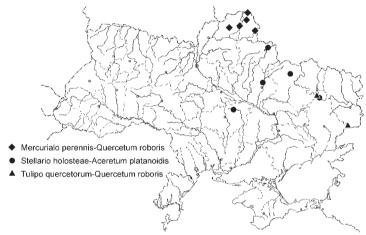


Fig. 4: Distribution of associations of the *Querco-Tilion* and *Scillo sibericae-Quercion* in Ukraine. Abb. 4: Verteilung der Assoziationen des *Querco-Tilion* und *Scillo sibericae-Quercion* in der Ukraine.

4.6. Scillo sibericae-Quercion roboris Onyshchenko 2009

Mesophilous forests of the *Fagetalia sylvaticae* in the forest-steppe and steppe regions of eastern Europe (Fig. 4, 5).

Stellario holosteae-Aceretum platanoidis Bajrak 1996 em. Onyshchenko et Sidenko 2002 Zonal association of the eastern part of the forest-steppe region of Ukraine. Besides it occurs in the steppe region. In the tree layer, Quercus robur, Tilia cordata, Fraxinus excelsior and Acer platanoides predominate.

Tulipo quercetorum-Quercetum roboris (Onyshchenko et al. 2007) Onyshchenko 2009 In Ukraine, the association occurs in the eastern part of the steppe region. Character species of the order *Fagetalia sylvaticae* are represented mainly by spring ephemeroids. In summer, the herb layer is mainly formed by nitrophilous species. Dominant species in the tree layer are *Fraxinus excelsior* and *Quercus robur*.



Fig. 5: Scilla siberica and Corydalis solida in a forest in eastern Ukraine. (Photo: Yu. Karpenko, April 2006). Abb. 5: Scilla siberica und Corydalis solida in einem Wald in der Ostukraine.

4.7. Paeonio dauricae-Quercion petraeae Didukh 1996

Crimean Quercus petraea, Fraxinus excelsior, Carpinus betulus and Acer stevenii forests. They have not many species that are common in forests in other regions of Europe. In Crimean broad-leaved forests, some endemic species occur, e.g. Paeonia daurica (Fig. 6).

Bromopsio benekenii-Carpinetum Didukh 1996

Hornbeam forests of the beech belt of the Crimean Mountains.

Lasero trilobi-Carpinetum Didukh 1996 em. Onyshchenko 2009

(Corno maris-Quercetum petraeae Didukh 1996, Vincetoxico scandentis-Fraxinetum excelsioris Didukh 1996)

Non-nitrophilous Quercus petraea, Carpinus betulus and Fraxinus excelsior forests of the Quercus petraea belt of the Crimean mountains.

Ranunculo constantinopolitani-Fraxinetum Didukh 1996 em. Onyshchenko 2009

(Polygonato multiflori-Quercetum petraeae Didukh 1996)

Nitrophilous Fraxinus excelsior and Quercus petraea forests of the Crimean Mountains (Fig. 7).

Fago-Aceretum stevenii Borhidi 1962 nom. invers. propos.

Acer stevenii forests on stony soils mainly at altitudes over 800 m.

4.8. Tilio platyphylli-Acerion pseudoplatani Klika 1955

Central European maple, lime and ash forests on steep slopes and on the bottom of ravines. In Ukraine, the alliance occurs only in the western part of the country (Fig. 8).

Arunco-Aceretum Moor 1952 s.l.

(*Lunario-Aceretum* Grüneberg et Schlüter 1957, *Mercuriali-Fraxinetum* (Klika 1942) Husová 1982). In Ukraine, the association occurs on siliceous soils in the Carpathians.

Phyllitido-Aceretum Moor 1952 s.l.

In Ukraine, the association occurs on stony calcareous soils in the Carpathians and Roztochia.



Fig. 6.: *Paeonia daurica*, an endemic character species of Crimean forests (Photo: V. Onyshchenko, May 2001).

Abb. 6: *Paeonia daurica*, eine endemische

Charakterart der Wälder der Krim.



Fig. 7: Dominant Ranunculus constatinopolitanus in the Ranunculo constantinopolitani-Fraxinetum (Photo: V. Onyshchenko, May 2001).

Abb. 7: Vorherrschender Ranunculus constatinopolitanus im Ranunculo constantinopolitani-Fraxinetum

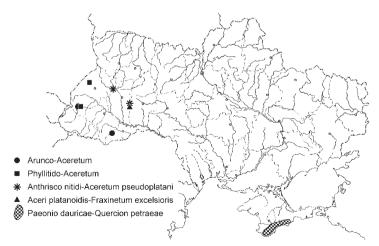


Fig. 8: Distribution of associations of the *Tilio-Acerion* and *Paeonio dauricae-Quercion petraeae* in Ukraine.

Abb. 8: Verteilung der Assoziationen des Tilio-Acerion und Paeonio dauricae-Quercion petraeae in der Ukraine.

Aceri platanoidis-Fraxinetum excelsioris Onyshchenko 1998

On limestone hills ("tovtras") and slopes of valleys in West Podillia. The tree layer is mainly formed by *Fraxinus excelsior* and *Acer platanoides*.

Anthrisco nitidi-Aceretum pseudoplatani Ralo et Onyshchenko 2008

The association occurs on bottoms of ravines in calcareous rocks in West Podillia. The tree layer is mainly formed by *Fraxinus excelsior* and *Acer pseudoplatanus*. This is the most species-rich association of the *Fagetalia sylvaticae* in Ukraine. The species number averages at 64 species of vascular plants species per 500 m². The association has some features of the *Alnion incanae*.

4.9. Alnion incanae Pawł, 1928

Hygrophilous forests of the Fagetalia sylvaticae s.l. (Fig. 9).

Alnetum incanae Lüdi 1921

Floodplain Alnus incana forests. In Ukraine, this association occurs in the Carpathians and adjacent areas. All Ukrainian forests of this association belong to its eastern (Carpathian) geographic variant. Differential species of this variant are Dentaria glandulosa, Salvia glutinosa, Symphytum cordatum (Fig. 10), and Telekia speciosa.

A similar differential block of species is a reason for distinguishing Carpathian and more western beech forests at the levels of association and suballiance (in some classification schemes at the level of alliance). So, we can consider eastern geographic variants of *Alnetum incanae*, *Arunco-Aceretum* and *Phyllitidi-Aceretum* as new potential associations.

Piceo-Alnetum Mráz 1959

(Caltho laetae-Alnetum (Zarzycki 1963) Stuchlik 1968)

Central European mountain alder and spruce-alder forests on moderately acidic gley soils. In Ukraine, this association occurs in the Carpathians.

Ficario-Ulmetum minoris Knapp 1942 em. J. Matuszkiewicz 1976

Forests on (seasonally) moist soils dominated by *Quercus robur*, *Alnus glutinosa*, *Ulmus minor* and *U. laevis*, occurring in lowlands in the deciduous forest and the forest-steppe geobotanical regions. It is found on floodplains and in gullies and depressions, sometimes on plateaus with poor drainage. This association is rather heterogenous. The analysis of Ukrainian relevés by TWINSPAN and the cluster analysis of syntaxa combine the subasso-

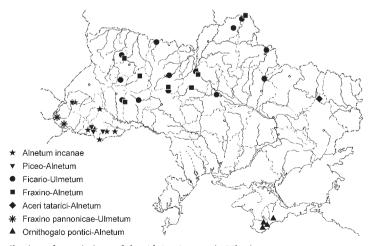


Fig. 9: Distribution of associations of the Alnion incanae in Ukraine.

Abb. 9: Verteilung der Assoziationen des Alnion incanae in der Ukraine.



Fig. 10: Symphytum cordatum in the Alnetum incanae (Photo: V. Onyshchenko, April 2007). Abb. 10: Symphytum cordatum im Alnetum incanae.

ciation F.-U. chrysosplenietosum Knapp 1942 em. J. Matuszkiewicz 1976 with the Fraxino-Alnetum, but not with other subassociations of the Ficario-Ulmetum.

Fraxino-Alnetum W. Matuszkiewicz 1952

Lowland wet forests dominated by Alnus glutinosa or Fraxinus excelsior with presence of hygrophytes.

Aceri tatarici-Alnetum glutinosae Onyshchenko 2009 ass. prov.

Alnus glutinosa forests of the steppe region.

Fraxino pannonicae-Ulmetum Soó 1960

Pannonian hygrophilous forests dominated by *Fraxinus angustifolia* and *Quercus robur*. In Ukraine, this association occurs only on the Transcarpathian lowland.

Ornithogalo pontici-Alnetum glutinosae Didukh 1996 em. Onyshchenko 2009

Crimean alder forests at altitudes ranging from 400 to 700 m. This association forms narrow strips along mountain rivers.

5. Conclusion

According to the presented classification scheme in Ukraine the order Fagetalia sylvaticae is represented by 31 associations, belonging to 9 alliances, as mentioned before. The forests of western and central Ukraine are classified in 'traditional' European alliances. Mesophilous forests of the eastern Ukraine and Crimea are treated as four alliances that are absent in central Europe. The analysis of data from other countries shows that eight associations described on Ukrainian material probably occur only on the territory of Ukraine (Galeobdolono lutei-Carpinetum, Aceri platanoidis-Fraxinetum and all Crimean associations). It is possible that increasing of the data set will allow describing some new associations, in particular with respect to the Tilio-Acerion and Alnion incanae in the Carpathians.

Acknowledgement

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Table 1: Constancy of species in associations of order Fagetalia sylvaticae on the territory of Ukraine. Tabelle 1: Stetigkeit der Arten in Assoziationen der Ordnung Fagetalia sylvaticae in der Ukraine.

Number of relevés	AdF 2	ScF 29		ShF 152	EvF 54			TC 121	IC 113			CC 19		MQ 22	ShA 52				AnA 24	ApF 25		LC 24	RF 15	FAs	0A 10	FA 9	AtA 9		PA 7	FpU FU 6 29
D.s. of one association								,										•		,										
Cirsium erisithales	100																													
Gentiana asclepiadea	100	8															33		,									27	14	
Geranium sylvaticum	100										,			7					,							,				17 .
Hypericum maculatum	100		2	4				· ·				5			Ċ		į.		4	Ċ	į.		į.						14	
Laserpitium latifolium	100		-		7			1	8		Ċ				Ċ		į.			Ċ	į.		į.			Ċ	i.			
Lathyrus laevigatus	100			į,	2			2		į.		5			Ċ		į.		i	Ċ	į.		į.			Ċ	i.			
Phyteuma spicatum	100				-			5				-			Ċ		33		i.											
Aconitum besseranum		•			21								,				•		,											
Astragalus glycyphyllos				1	45		3	2	6	12					3				Ċ											
Cypripedium calceolus			1	1	24		Ī	-											Ċ								į.			
Hieracium gentile				19	28		10	2	Ċ																					
Staphylea pinnata		•		4	34			2	Ċ		20						•													
Vicia sylvatica				7	23					4	LV								,								•			
Cardaminopsis arenosa		2			20	83		•		,	10									8							•			
Epilobium montanum		8	5	4	2	25	3	1	2	2	10				•		-		8	0			•		-				•	
Euphorbia cyparissias		O	1		~	25	0	,		11			,						U	i						-				
			- 1	*		42		•		- 11									*	4			•							
Galium transcarpaticum				*				*			10						*													
Helleborus purpurascens			4	*		50		•	÷	÷	10		•				*				•		•							
Hypericum hirsutum				*		25			5	5					2					3										
Seseli libanotis						58																								
Moehringia muscosa						42																								
Orthilia secunda			1	15	2	33	10	8						10																
Securigera varia						25				4																				
Taxus baccata			5			83	3															4								
Tilia platyphyllos						83																								
Valeriana tripteris		2				33																						9		
Vincetoxicum hirundinaria				2	11	50		1	8	2	10									3										
Lathyrus laxiflorus				-			21			-									Ť.		18	4								
Corvdalis intermedia		•		•			~.	•		29			•	7					•			•					•			. 2
Viola hirta	•	•		•			•	o	8	23			13	,						4	•		•							. 13
			10	1	3			1					10						4	**										. 10
Symphytum tuberosum s.l. Leucojum vernum			19		3			,			90	0.4	•								•									
	•	8		2			•			- :		21						•	17							•		•		
Steris viscaria							-	:		4			25																	
Platanthera bifolia			12					4		3				26																
Rubus saxatilis								12		2				44					-											
Pteridium aquilinum				1	2			17		4	20			26													11		14	
Trientalis europaea								13						34																
Ballota nigra							-		3	4						31														
Cynoglossum officinale																23														
Leonurus villosus									0							38				4										
Torilis japonica								1	3	14						54			i	3		4	7							. 7
Tulipa quercetorum										9					30	100														
Calamagrostis villosa		2															33													
Cicerbita alpina		_					,										33			,				,						
Equisetum hyemale			3	2	2		•	3		2	•						33		4					•		11				
Oreopteris limbosperma			0	2	2			3		2							33		4							- 11				
		10		10			•	o	•		•						33	•	•			•						9	14	
Phegopteris connectilis		15									20								,			•		,				9	14	
Vinca minor			4	4				1	4		20						33		4			•								
Gagea spathacea				- 1			•	-										33				•							•	
Grossularia uva-crispa		8		1				7	9	6								33								•		9		
Huperzia selago				20				1			-							33												
Ribes lucidum					4							11						33		4.										
Anthriscus nitida				1	2				11										96	10								9		
Campanula latifolia					2														46											
Cerastium sylvaticum				1	,		,												58					,						
Dipsacus pilosus					,		,				,								21					,		11				. 17
Equisetum arvense		4		1				0		2									25		9							9		. 4
Primula elatior			1					2											42											
Rumex obtusifolius s.l.									4										29							11			14	
Salix caprea		2			,			2	Ö		,								25		18			,				18		
Galeopsis pubescens		_		12			- 1	15	6											27	Ţ					-				. 8
Hordelymus europaeus				2	5			,	16										4	29										
Omphalodes scorpioides				_	0		•	3	14	8									,	21		•		•						. 2
Paeonia daurica							21	J		J											18	79	27	20						
Vincetoxicum scandens					- 1				•				•		2	22		-			10		21							
				•	•		14	•	•		•				2	23		*		*	27	83	90	20				•		
Smyrnium perfoliatum					*		10	•	•	•	•	,	•							*	27	4	80	100	,					
Acer stevenii				•			10		÷		•		•		•						9	8		100		•		•		
Arctium nemorosum							•	- ;	5									*		3					70	•				100
Berberis vulgaris								1		2								*						*	20					
Bupleurum rotundifolium												,													80					
Clematis vitalba							8															13			40					
Colchicum umbrosum																					9	13		20	60					
Conium maculatum																									30	11				
Geranium purpureum												,													50					
Geum rivale								11				21		7												67		9		. 17
Ribes nigrum			•				•	1	•		•		•	•										,		44		-		. 8
Agrostis capillaris			•				•	1	•		10			10										*		-4-4	22	9		. 0
					*		•	,	•		10		•	10	•			*				•		*				5		
Calystegia sepium			•		*		٠	ć	٠			,			•					*		٠		٠		رز	22			
Carex elongata								2	1						-					-						11	100	٠.		1. 2
Carex pallescens								1	0																		33			. 7
Carduus personata																												27		
Matteuccia struthiopteris		4																										55		
Petasites hybridus																				-								27		
Telekia speciosa																												27		

	AdF	ScF	CF	ShF	EvF	SIF	LaF	TC	IC	GC	CpC	СС	A-T	MQ	ShA	TQ	AA	PhA	AnA.	ApF	ВС	LC	RF	FAs	OA	FA	AtA	Ai	PA	FpU	FU
Agrostis stolonifera	,		,							,	,		,	,		,									,	,	,		29		
Circaea alpina		4	5	1						4.			:_						:_									9	43		
Equisetum sylvaticum			2	5				5		1		5	13	5					17				*					9	71		
Lonicera nigra		2 28	1	28	19			23	5	2		11		7			33		29		*		*				•	9	29 100		2
Picea abies Prunella vulgaris		20	1	20	15		10	23	0	~		"		′	2		33		23		9		*					9	43	17	~
Salix aurita															-														29		
Leucanthemum rotundifolium		2																	Ċ			Ċ							29		
Streptopus amplexifolium		2																											29		
Carex strigosa																														100	
Iris pseudacorus																										11				50	
Leucojum aestivum																			•											33	
Phalaroides arundinacea		•		•															•		•						11		•	67 33	
Polygonum hydropiper Selinium carvifolia	,	*	,					•									•				•					,	11		,	67	
Xanthoxalis fontana									o										Ċ											33	
D.s. of two associations			-																							-					
Lilium martagon	50	4	6	1	62			18	8	3		5	13						4	3											4
Calamagrostis arundinacea	100					75		16					13	24												11					
Rosa pendulina	50	2				75					-:-																		14		
Luzula luzuloides	50	19	10			17		:			50		-	-															4		
Gymnocarpium dryopteris		25	12 2	25	3	17		1					-	5									•			-			14		
Abies alba Galeopsis speciosa		55 26	14	1 3			•	1				16	-	-			100	33	38									9	29	17	2
Cephalanthera longifolia		20	21	J		•	35	2		4	10	11							30		18	4	•				•	3		17	~
Melittis carpatica + M. sarmatica		Ċ	4	1	61	33		9	4	Ċ	10						Ċ	Ċ	Ċ			Ċ	Ċ					Ċ			Ċ
Cephalanthera rubra		į.			39		62	2													9	13									
Lonicera xylosteum		6	3	5	36			4	22			11							17	3								9	14		
Clematis recta					28			3	17	4	:-		38							-											
Asplenium trichomanes				٠		100		1	8		10							67		20			,				-				
Asplenium viride		:	-	٠		50											٠	33								٠			-		
Phyllitis scolopendrium Polypodium vulgare		4 8	5 1	3		50 58	٠		٠	4	10	•	38					100 100		8			•				-	9			
Polystichum aculeatum		19	5	6	3	83		*		4	10	•	30				JJ	67	17	U	•		•				-	J			
Vaccinium myrtillus				3		33		17					13	5					.,										43		
Sorbus torminalis		· ·	1	-			21		0		10	į.		-			·				į.	54	7								
Euonymus latifolia							25														9	17	7		50						
Vicia sepium				1					33	2				21									,								
Carex spicata + C. muricata								2	32	11					14	23				14		13	7								7
Viburnum lantana		0	-	1				-	60	14		-		-	4					47											<u>.</u>
Melampyrum nemorosum s.l.			2					5	17	15	40	5	25	5									*							-	7
Crocus heuffelianus Fraxinus angustifolia			6	•							20	74 42																		50 100	
Taraxacum officinale			6				3	1	12	7		5	25			8				6	18		,		50	11				17	7
Phalacroloma annuum			2					Ċ	5	2			25							·	,								÷	50	
Melica picta									17						29	46				11											
Aruncus dioicus		4	4	2	5						10						33		21												
Veratrum lobelianum								3				-					33		<u>.</u> .							22			-		2
Ranunculus lanuginosus		- ;	2	4				2	6	-		11	-	٠				33	75								٠				
Melandrium dioicum Chaerophyllum aromaticum	٠	4	2	3	3	•		2 3	5 5	2		5	*	٠		٠			38 67	62 4			*	*	•		٠	9 36			17
Chelidonium majus	٠		1	2	3		•	7	2	8	,			3	5	23			01	69			7		•	,	56	9	•		2
Bromopsis benekenii				4	23		13	1	27	4										22	73	25	7	20	80						
Crocus tauricus				Ċ		÷	15	Ċ	-:	Ċ							÷	÷			50	89	27								Ċ
Tamus communis																					27	17	40								
Heracleum sibiricum										1											36	4			50		٠				
Aegonychon purpureo-caeruleum							17		4	2					3						18	46	27		10						
Lathyrus rotundifolius	٠						- 5							٠								38	33								
Ornithogalum ponticum	٠		,				4	•		•				•	·	8		•			9	17 38	40 13	20	40		٠		•		
Dictamnus gymnostylis Laser trilobum							Ā			•				-	7	0					9	38	13	20 20							
Equisetum telmateia			2	1			7			-				•					4		9	00		20	30				29		
Humulus lupulus			-	Ĺ			8		Ċ	2	Ċ	Ċ		3				·	Ċ	8	Ţ	Ċ			20	56	78				20
Lysimachia vulgaris										0				5												44	89		14	33	11
Scutellaria galericulata					,									,												22	22				
Caltha palustris s.l.			,	7				2				5														44			100		
Galium palustre	٠									5								,							•	33		9	43	17	2
Solanum dulcamara Ulmus laevis	•	2	6	•	•			•	•	4		5		*	19	•			•	•	•	٠		•	٠	22	70		43	33	4
Acer negundo	•								i	3	•	•	13		19								′		•	11	78 33			33	25
Alnus incana		2					:	:			10		,,,				33		:							- 11		100	100		2
Petasites albus		14	Ċ	2	2								÷			÷			13				i	÷				27	43		-
Chaerophyllum hirsutum														,					4									27	29		
Myosotis palustris																													57	33	
Carex remota			2	5					0																				43	83	
Eastern European species										_											00			00							
Corydalis marschalliana	•						3	:		2						77			•		33	100		80							
Dentaria quinquefolia Scilla siberica		•				•	78	1	•	2 10		•	•		50 92	100			•			100 78		100	90	•	22	•		•	
"Carpathian" species		•				•	•	•		10	•	*	*		32	100		•	•		•	10	20		•	•	~~	•	•	•	
Dentaria glandulosa		86	24	17	8	17		7	20			5						100	71	7						11		60			
Rubus hirtus		82	85	56	9	42	10	20				63		Ċ				33			27							45	43		
Salvia glutinosa		22	29	6	23		3		17		10	,				Ċ			17		27				:	:	Ċ	64		÷	
Symphytum cordatum		74	1						,		,			Ċ	÷	Ċ		67									Ċ		14		
"Crimean" species																															
Allium cyrillii							4														45		47								
Arum elongatum							51														67		100		90						
Galanthus plicatus Lathyrus aureus	•	•		•			<i>29</i> 53	•	•	٠		•		•		•	•	•		•	67 82		87 13	60					•		•
Physospermum cornubiense				•			24	•		•	•		•	•		•	•	•	•	:	55		93	40	20	•			•		•
	•						16											Ċ		Ċ											
Ranunculus constantinopolitanus	Is						16					-										13		40	50					÷	
	ts	31	53	70	92	100		73	88	85	. 10	21	88	100	90	. 8		33	88							78					75

	AdF	ScF	CF	ShF	EvF	SIF	LaF	TC	IC	GC	СрС	СС	A-T	MQ	ShA	то	АА	PhA	AnA .	AnEl	ВС	LC	BE	FAs	OA	FA	AtA	Ai	PA f	-pU	FU
Aegopodium podagraria	jrtui.	19		42	88			61	87	46	10	68	50	89	55		33		100					1 /10		67	_	64			59
Asarum europaeum		4	17	58	98	50		65	95	76	10	79		100				33	100							56		27	14		21
Anemone ranunculoides		15	4	18	31	25		30	83	78	10	5		58	93	85		33	88	94						67	56	60			47
Carex pilosa	.:.	6	43	27	20			34	48	53	80		13	75	31		33									11					2
Stellaria holostea	100	2	10	50	50	•		83	84	84	70	89	88	97	96	77	33		75	56						11	67	18			19
Hygrophilous species			1	a				6		2		_	10	2					8						100	100	100		14		21
Alnus glutinosa Cardamine amara		4	2	4	-	•	-	b	-	3	-	5	13	3	-				0	•		-		-	100	56		18	29		21
Chrysosplenium alternifolium		4	1	2				8	4	3		5		3					71	12						67		27			21
Cirsium oleraceum			Ċ	-	2				· ·	- 7			· ·	-			Ċ				Ċ		Ċ	· ·		56			57		8
Juncus effusus				4				0																			22		29	33	
Lycopus europaeus																										22	11			33	
Lysimachia nummularia				1	3			3	1	2		16							54							56	22	9			43
Myosoton aquaticum		٠					•			:		-							25							22				17	8
Ranunculus repens Rubus caesius			2	2	6			1 9	9	1 8	-	5 26			-	8			4	6			7	-	50	44 11		55 27		33 83	6 67
Stellaria nemorum		22	,	8	0		•	2	9	0	•	20	,			0	67		75	В			/	٠	50	33	,			33	8
Ch Fagetalia sylvaticae			•	0				-			•		,				01		13	•		•		٠		00	•	04	23	00	
Acer pseudoplatanus	100	72	65	86	96	100		38	51	2	10	32					100	100	100	71						22		55	43		15
Actaea spicata		10	13	31	93			8	23	7	10				5		33	100	50	19											23
Adoxa moschatellina		6		12	5			26	27	43				17	7	15				24							56				15
Allium ursinum			2					1	21	3		5		3	2					44						22		27			4
Carex sylvatica		19	34	34	27			16	22	4	20	47		3			33		83	•	9			-				27		50	6
Circaea lutetiana Corydalis cava		35 29	34	22 21	3 14	50		3 20	9 51	2 56	:	37		30	11				63 92	96				٠	*	22 11	33	18			29 21
Corydalis cava Corydalis solida s.l. (incl. C. paczoskii	٠.	67		23	23	50	:	35	77	81	10			20		100		100		89	33	11	40	•		"	22	20			21
Daphne mezereum		2	5	19	71			14	18						,		33	33	58	7		.,						18	43		2
Dentaria bulbifera		85	55	4	5	50		9	24	35	40	16			11			33	25	44								20			4
Dryopteris filix-mas		68	49	80	37	100	5	39	30	32	50	53	75	11	9		100	67	88	33				80				9	29		25
Euphorbia amygdaloides	.1.	24	20	. : .	. : .		45		10		30	26					33	. : .	٠.	٠.	27	67		20	10			9	14		
Fagus sylvatica	100	100	100			100	100	22	3		50	26	,	1				100		4	73	38		60		,	4.5	9	29		10
Festuca gigantea			•	11	12 8		•	13 29	6 62	7 42	ı.	5 84	13 ?	5 37	2	38 54		•	63 96	28	9 9	20	62	40	70	22 56	11 56	36 60			18 44
Ficaria verna Gagea lutea			•	12 14	8		•	15	54	42	40	84	ſ	37 27	38 52	54 54		•		63	17	22	63	40	70	56	56	60			44 29
Gagea minima								7	11	28		5		7	25	54				19	.,	:					:		:		2
Galium odoratum		57	82	86	98	67	67	53	72	50	30	89		13	47	46	33	Ċ	100		91	33		80	30	11		9	14		27
Hepatica nobilis			12	43	93	100		31	30			21						33	42												2
Lamium galeobdolon		41	54	81	96			68	88	66	40	79	13					67		66						33			29		17
Lathraea squamaria			1	1	2			14	7	5				10	9				33		27				10			20			2
Mercurialis perennis		63	21	7		100		20	58	22	10	5		50	27		33	33			64			100	40	11		36	29		4
Milium effusum Neottia nidus-avis		13	7 26	38 3	5 89		33 81	44 12	43 9	11 7	20	58 5	•	25	2	8	100	•	67	21	64 91	13 33	13			11	44			17	13
Polygonatum multiflorum		2	13	68	93	50	01	61	69	67	70	79	:	50	85	69			92	88		4	47	:			33				48
Paris quadrifolia		10	5	25	24			42	39	11		26		40	5		100	67	67	6	Ċ					67		9	29		53
Pulmonaria obscura + P. officinalis		4	30	44	94	Ċ	8	51	91	76	40	58	38	48	81	8	33			57	9			20	50	22		64			42
Ranunculus cassubicus		2	5	16	45			29	72	4		47			7					19						22	11	9			8
Sanicula europaea		4	31	18	83		13	25	24	5	10	11								12	18	13	7		10	11					4
Scrophularia nodosa		6	15	34	69			8	13	15	10	32			4	8			42	4						22	22	9			13
Stachys sylvatica		39	20	30	42	<i>-</i> -		13	26	10	10	16	-1		7	8				16	9		-		60	44					23
Ulmus glabra		14	23	41	85	67	3	29	67	44	Ċ	11	50	20	28			33		88	9	4	7		70	44		9	44		46
Viola reichenbachiana Ch Querco-Fagetea		14	60	57	70			42	57	12	60	68		•	2	•		•	71	6	9	4	7					27	14		2
Acer campestre			16	9	25		38	8	77	65	30	68		18	96	100			13	54	36	88	93		50	33				33	58
Carex digitata		6	23	64	95	100	57	49	23	33	40		63	37	5	15			42		55	25		20			:	:			
Brachypodium sylvatica			5	5	43		-,	6	27	18	,	11			16	38	Ċ	·	54		27	8	7		30	Ċ	33	9		÷	33
Euonymus europaea		8	2	31	71	25	8	33	71	50	10	74	38		70	85					55	46	7		40	56	11	9			83
Euonymus verrucosa				27	98		21	43	71	67		5	100		51	15			54	72	18	67	40		20	22					21
Epipactis helleborine		1.	33	3	61		56	4	13	15		21		21	2	. : .	2.				9	33			2.			9			
Fraxinus excelsior		19	21	19	79		39	33	78	48	,	11	13	13	87	100	33				73	83		100	40	33	11	18			88
Corylus avellana	50	27	22	24	77	67	4	64	57	42	60	42	100	93	54			33			45	25	7		60	56		27	43	17	47
Hedera helix			34 28	<i>36</i> 45	46 96	100	31	5 42	2 66	36	80 20	58 26	63	87	58	31			<i>25</i> 50	34 6	45	49	47		10						6
Lathyrus vernus Melica nutans	100		2	18	68	67		39	33	26		16	88	34	2	31		•	4	3		•						•			7
Scilla bifolia			-	1			48		11	37					-			:			84	100	83	60				60			2
Viola mirabilis			1	18	91		3	29	64	44	÷		25	50	44					41	9	4	,	,	20	11					11
Viola odorata							7	4	46	67				38	46	85					45	21	13	60			22	,			2
Other species								_																							
Acer tataricum								5	16	23	30	16	63		18	31										11	89				31
Achillea stricta	50		10	20	90		•	ee.	F0	F	10	70	10		•	•						•				20		ò		•	
Ajuga reptans		2	18 9	30 1	82 5	25	•	56 10	52 35	5 24	40 10	79 5	13 13	3	24	77	•		83 33	3 43	•		12	40	30	22	•	9		17	2 28
Alliaria petiolata Anemone nemorosa	100	52	<i>36</i>		100	20		87	33	4	70	89	13	3	24	"	33	67	92	3	•		13	40	30	33		60			28 13
Anthriscus sylvestris	100	16	30	00	.00		22	1	1	7	,,	00	25		4	8	00	0,	4	7	36	17	13	60	100	55		27			4
Arum besseranum + A. alpinum			Ċ	4	2			Ċ	46						Ċ			33	38	85	,			,				18		÷	2
Aposeris foetida	50			27	37	Ċ		13	,		10	11							46		į.						Ċ	9			-
Astrantia major	50		1		3			1																				9	14		
Athyrium filix-femina	50	88	37	60	6	17		27	11	7		37		20			100	67	67							44	44	36	86		13
Betula pendula		8	1	18	2			50	12	20			13	50	5				13	4						33	56		14		21
Campanula persicifolia	E0		1	4	62	25	•	4	4	20			25		4					17		•								•	7
Campanula rapunculoides Campanula trachelium	50		1	1	68	50	•	2 9	49 54	22 17	10	11	50	7	4 3	8		•	4 58	17 40	27	8						٠			/
Campanula tracnellum Cardaminopsis halleri	50	•	1	8	00	30	•	ð	54	17	10	11		/	ی	0	•	•	50	+0	41	O	•	•	•		•				
Carex brizoides	30	4		8	•			23		o		63					•	•	13				:			11		9	43	:	:
Carpinus betulus		13	53	50	58	50	70		100		90	95	13	3	26		Ċ	100		62	91	96	93	100		11		18		50	58
Cephalanthera damasonium			4	1	91		39	5	10							,			4		27										
Cerasus avium		4	52	19	54		13	18	63	22	90	53			6			33	38		18	29	13		40						36
Chaerophyllum temulum				2			3	9	16	22			2.	4	14	54					27					11	-				36
Convallaria majalis				7	66		7	39	51	43			50	63	34	8		33	4		18	13				11	22				24
Cornus mas			10		24		17	10	16	5	on.	40			2	-		,			55 46	88	60	20	60		70	'n			
Crataegus curvisepala Cruciata glabra			16 2	3	24 27		12	13 30	35 14	40	80 50	42 5	13	•	30	69		•	4	18	45	46	7	20	60	11	78	9		•	47
Cruciata giabra Cystopteris fragilis			2	3	21	50	3	2	4	20	10	9	38	7				67	4	23				1		11		9	:	17	2
- / - /- Pre	,			_			_	-						,		,						-		-					-		-

	AdF	ScF	CF	ShF	EvF	SIF	LaF	TC	IC	GC	СрС	CC	A-T	MQ	ShA	TQ	AA	PhA	AnA /	ApF	BC I	LC	RF	FAs	OA	FA	AtA	Ai	PA	FpU	FU
Dactylis glomerata s.l.	50	,	5	2	6		27	5	37	31	50	16	25		13	69			4		45	4		40			22	9		17	
Deschampsia caespitosa	50	,		1				5				,		3					8							22		9	29		22
Digitalis grandiflora Dryopteris carthusiana	50	14	9	60	2 19	•		48	8	9	10	16	25	64	2		33	33	63			•			•	78	44	9	86		33
Dryopteris dilatata +D. expansa		28	1	40				6	2		10		23	04	-				29										14		
Fallopia dumetorum		-,	4			25		Ţ,	10	15		Ċ	38		6	38				35	÷						33	Ċ			13
Filipendula ulmaria		,										5					67									89	22	36	57	50	8
Fragaria vesca			9	1	6		28	14	16	9	30	11		5				33	4		45	8				2.		9	14		6
Frangula alnus				6 4	4			14	2	2	50	11		27					40							33	56		14		27
Galanthus nivalis Galium aparine			3	2	20			13 4	33 35	5 27	•	42	13	•	23	38				87 78	18	17	53	20	80	44	33	20 18	•	33	2 40
	100	6	40	1	2	100		9	12	2	60	5	10		23	30			23	3	10	17	33	20	ou	44	33	10		33	40
Galium verum		4		3	-			3		-										,			20								
Genista tinctoria											20																				
Geranium phaeum				1				6	19			21					33			21								18			2
Geranium robertianum		26	20	27	22	50	8	23	28	25	20	5		3	2	38		33		79	9		:_	2.		11	44	18	14	33	34
Geum urbanum		4	12	6	12	50	23	23 4	73	60		42		25	37	92				64	73	25	47	20	60	22	56	18	-	17	66
Glechoma hederacea Glechoma hirsuta	•	<i>11</i> 31	8	•	•	50	•	10	0 77	1 57	20	16 16		58	2 40	8	67		58 17	46	18	•			30	11 22	44	27 45	14	83	27 42
Hesperis matronalis		31		•	•	30		10	"	31	20	10		50	40	0	07		17	40	10	•		20	•	22		40	14		42
Hylotelephium argutum	50												Ċ				33	33		:			Ċ					18		Ċ	
Hylotelephium polonicum s.l.	50					50			8	14	10		50		2				4	39											
Impatiens noli-tangere		37	7	13	2	25		2	5	2		5		3	9		67		88							22	33	55	29	50	10
Impatiens parviflora		10	8	6				0	1	23			50					-	17							22		18	-		39
Isopyrum thalictroides	-	43		36	37			21	59	1	20	16							92	45						22		20	11		8
Knautia dipsacifolia Lamium maculatum	50	9	1	4	2		8	5	35	24	•	5	63	13	25	46	*		79	69	9	8	7		40	33	*	55	14	•	17
Lamium purpureum		ð	-	4	2		3	J	J	4		J	uJ	13	23	40	67		15	ud	ø	4	/	60	40	11		JJ			17
Lapsana communis			3	3			27	5	27	9		5			6	46			46	25	45	29	20	20	40	11					17
Lathyrus niger			2		27			1	28	26	10	5	38		3	15				6	27	42			Ţ,					i	i
Ligustrum vulgare							17			2	60					8					18	50	7	20	60						
Lunaria rediviva		33	÷		-	25											67	33		44								27			
Luzula pilosa		2	7	37	7	22		41	22	17	20		25	18			22		4												in
Majanthemum bifolium Malus sylvestris		6		78	94	33		80 8	33	17 2	20 20	53	25	73 10	8	8	33		46 4	3					•	11			14	•	15 8
Melica uniflora		,				,		U	6	-	20			10	0	U			4	13									14		0
Mentha longifolia													Ċ												20			Ċ			
Moehringia trinervia		20	6	10	2			14	8	22		5		7	2	8		33	54	9						22	44				26
Mycelis muralis		33	39	37	70	67	18	16	7	11	10							33	25	11	27							27	14	17	11
Orchis mascula	50				:_		4	<u>.</u> .				4.							Ŀ.		9	4			10	1.					-
Oxalis acetosella		53	19	42	12			51	- 1			21		-			67		88	*						11		27	43		2
Padus avium Picris hieracioides	50			5	2			20	1	9		11	25	52			*		29		•				•	67	33	27	•	,	46
Pinus sylvestris			4	15	16			41	1	3				26					8		:						33				7
Platanthera chlorantha	į.			21	42		78	25	8					3					17		36	17	27		10	· ·					
Pleurospermum austriacum	50																	,										,			
Poa chaixii	50																														
Poa nemoralis		2	12	46	97	25	64	14	41	42	70		100	10	21	54		33			73	33	13	20	30	11	56	18			7
Polygonatum hirtum				1	4		8 92	10	74	16 11		5	25	20		•		•	13		27 82	54 42	7 40	40	40	11		•			6
Polygonatum odoratum Polygonatum verticillatum	50	21		3	2			18 2		,,			25	26	6		33				02	42	40	40		11		9			
Polystichum braunii		2		1													67	33	4	:											
Populus tremula	į.	-	2	19	6	i	30	33	8	16		11		33	9	Ċ			13		27	13			10	11	11	Ċ	14		28
Potentilla erecta	50							2			10																				
Primula acaulis		:				50	53	7												-	64	71	60	60	80	11		9			
Pyrethrum clusii	50	2	-						13	:							-									-			-	-	
Pyrethrum corymbosum Pyrus communis			i		11			9	8	4 27	40		13		20	46		-		-	9	8 13	13	20	10		67			-	17
Quercus petraea			22	7	2	•	35	3	•	1	90				20	40		-	•	-	55		87	20	10	•	0,	9			17
Quercus robur			9	32	19			89	83	80		68	75	92	91	100			63	25						44	56			83	83
Rosa canina									5	9	40	5			2	8						38	13		20						
Rubus idaeus	50	4	7	13	3	25		10	2	2			13	3			33		25							11		45	57		2
Sambucus ebulus		0			2		÷														9				20			<i>i</i> -			
Sambucus nigra Sambucus racemosa		46 10	36	49 34	57	25	5	21 3	29 2	24 1	10	47		•	9	31		33	96	92	18	•	20		50	33	22	45	14 29	-	55
Scutellaria altissima				J+			3		17	18					5	31			:	65		8	20		40		~~		23	•	
Senecio ovatus	50	51		1	Ċ									Ċ			67		8									18	71		
Solidago virgaurea	50	6	1	3	8	42		4		13	30	,	25	14		,			4	ì	9							27			
Sorbus aucuparia	50	22	6	28	37	100	13	40	0	15		5	50	49		,			4	,	9	4	13			11		18	71		11
Stellaria media							5		0	0		16		-									20			4				,	
Swida sanquinea			28		89	•	4	13	53	21	70	37	100	5	42	ic.					36	8	7		70	11		18		50	56
Tilia cordata Ulmus minor			13	30	66		30 8	65 4	76 29	64 14	20	63 11	100	87 23	87 40	46 62		•	88 4	41 6	45 9	21	27	•		44 22	11	9		50	45 60
Urtica dioica s.l.		34	20	25	3	25		33	34	32	10	26		27			33	33	100			-1		20	80	78		73	43	100	
Valeriana collina	50					_,														7		÷	i	_,							
Veronica chamaedrys			3	1	8			6	8	17		5	50							20							22				
Viburnum opulus		2	2	2	45		2	15	18	6	10	32		21					4		18		1		_:	22			29		58
Viola dehnhardtii							33							*						. 1	100	75	13		70						
Other species with constancy >10%										,			10																		
Achillea submillefolium Aconitum moldavicum		15		i					•	4			13		•								•		*			9	•		
Aconitum moldavicum Aconitum sp.	50	10															33											3		•	•
Alisma plantago-aquatica									Ċ																	11				17	
Alopecurus aequalis																														17	
Anemone sylvestris										:		:														11					
Angelica sylvestris										0		5														11					13
Archangelica officinalis																					10					11					
Arctium sp. Aristolochia clematitis			٠						0			•	13		٠	8		٠	•		18									٠	4 7
Artemisia vulgaris	:		:	:		:							10	:			:								:			:	-	17	
								•											•	•					-		-				
Asplenium ruta-muraria						17																		-							

	AdF	ScF	CF	ShF	EvF	SIF	LaF	TC	IC	GC	CpC	cc	A-T	MQ	ShA	TQ	AA	PhA	AnA	ApF	ВС	LC	RF	FAs	OA	FA	AtA	Ai	PA	FpU	FU
Barbarea vulgaris																														17	
Bidens frondosa																														17	
Bidens tripartita														٠																17	
Calamagrostis epigeios Calamintha grandiflora		•		3			13		•	2			•	•		•			•		٠	*		٠		11			•		
Carduus cinereus							13															*				•			14		
Campanula patula			1					2	Ô			11	-				Ċ				Ċ			-					14		:
Caragana arborescens		·		Ċ	·		Ċ	-	2	1				÷	Ċ	15	Ċ	÷	Ċ	Ċ	Ċ			Ċ			Ċ	Ċ			4
Cardamine impatiens		4										5																9	14		7
Carex acutiformis																										11	11				
Carex cinerea										*												1	-				11				
Carex cuspidata							13		٠	10		*			2						18	4	/	•		٠					
Carex michelii Carex riparia	•						•			18				٠	2							8		٠		•		٠		17	
Carex sp.										-											Ċ					11					
Carpinus orientalis																					18	13									
Cimicifuga europaea					19			1																							4
Cirsium arvense							٠		1											4										17	
Cirsium rivulare					2		٠	ŕ		ć		*	٠		ò	10					٠	10	ż			٠		*	14		
Clinopodium vulgare Corallorhiza trifida					11		18	5	2	8					2	15						13	/	20		٠			•		
Coccyganthe flos-cuculi							10		٠		٠	11							•										•	17	
Crataegus orientalis			Ċ			Ċ					Ċ			:				÷					13	:	Ċ		Ċ	Ċ	Ċ		:
Dryopteris cristata				2																						11					
Epipactis atrorubens			5			17																									
Epipactis microphylla							14		٠				٠								9	4				٠			٠.		
Equisetum palustre			÷			17	٠		٠				٠	•		•			•		٠			٠		٠			14		
Festuca drymeja Galeopsis bifida			5			17	•		٠	3			•	11				•				1				٠	11				
Geranium sanguineum		:						:		1			13		:						:		:								:
Glyceria fluitans		:				:			Ċ				,	:		:			:				:					÷	÷	17	
Glyceria plicata																										11					
Hieracium sp.				13	15						60										9	4				٠					
Hypericum tetrapterum Juncus tenuis							٠		٠		10		٠								•	•		٠		٠				17	
Lactuca chaixii	•	•									10			٠		15						•		٠						17	
Leersia oryzoides				:											:			:												17	:
Listera ovata			2		3		4	5	13	į.		5							17		9				10	11					8
Luzula forsteri								,													18	4					,				
Luzula sylvatica		2	2			17		1																		٠					
Matricaria perforata Lysimachia nemorum							٠		٠				٠									4				٠				17	
Lythrum salicaria		•		•	•		•					•		•		•						•		٠		٠	11		•	17	
Mentha sp.																											11				:
Morus nigra			Ċ	Ċ												15	- :	Ċ	Ċ	Ċ	Ċ		Ċ	Ċ				Ċ	Ċ		
Myosotis nemorosa																			8			,								17	
Myosotis sylvatica		4																										9		17	
Parietaria officinalis																				17											
Phragmites australis		•				-		•		•									•				10			11	•		-		
Physocaulis nodosus Plantago major		•				•			1	•													13							17	
Poa longifolia							3														18					Ċ					
Poa sterilis				į.			13			į.										i.						Ċ					
Poa sylvicola			1																								11				
Poa trivialis							:		0	0																11					
Potentilla micrantha		10	ċ				4					-											13		10			9			
Prenanthes purpurea Quercus pubescens		12	5				13			•									•									9			
Ranunculus flammula																													14		
Ribes carpaticum		11								Ċ						į.				i.	Ċ					Ċ	į.				
Ribes sp.																	33														
Ribes spicatum								1		1										1											15
Robinia pseudoacacia Rorippa sylvestris			4					1		3					. 2					3							11			17	
Rosa dumalis		•			14			1							2				à		•						•			17	
Rosa sp.							13			1											18	4					33				
Rumex conglomeratus																														17	
Salix cinerea																					,					11			14		11
Salix fragilis																												18			2
Salix triandra Scirpus sylvaticus		*								*		ė									*					11	11		1.4		
Senecio jacobaea												5														11	11		14	17	
Stachys palustris																											i		:	17	
Swida alba			1	Ċ						į.				Ċ		Ċ		Ċ	į.							11					
Symphytum tauricum							10															4	13								
Tilia begoniifolia							14														9	8			10						
Valeriana dioica		*		•		17				1											•								14		
Valeriana stolonifera Veronica beccabunga				•		17				1																11	•		14		
Veronica beccabunga Veronica hederifolia									4						2	15										- 1	11		1**		
Veronica riedemona Veronica officinalis			6	17	5			8		Ö	10		13	5	-							8							:		
Veronica umbrosa						÷	13				Ţ.										18	13	7								
Vicia dumetorum				1	20			1																							
Viola biflora																													14		
Tree layer (h> 5,0 m)																															
Number of relevés with data on tree layer	2	29	18	119	54	5	26	121	113	63	10	19	8	22	51	13	3	1	24	25	6	9	5	0	0	9	9	4	3	6	29
Abies alba		15																100						nd	nd						
Acer campestre				2	12		16	8	35	18					85	69			8	27	33	33	80	nd	nd				:	33	27
Acer negundo										2														nd	nd						14
Acer platanoides		40	1	29	63	42		40	45	60	10		50	74	78	8				100				nd	nd	22		2			23
Acer pseudoplatanus	100	60	6	37	78	25		32	29		10						100		100	52				nd	nd			25	33		7

	AdF	ScF	CF	ShF	EvF	SIF	LaF	TC	IC	GC	CpC	CC	A-T	MQ	ShA	TQ	AA	PhA	AnA	ApF	BC	LC	RF	FAs	OA	FΑ	AtA	Ai	PA	FpU	FL
Acer stevenii							20				-													nd	nd						-
Acer tataricum									4	2						8								nd	nd						9
Alnus glutinosa				3				3				2	13	3										nd	nd	100	100				21
Alnus incana		2																						nd	nd			100	100		2
Betula pendula		6		15				42	12	17			13	50	6				13					nd	nd	33	44		33		13
Carpinus betulus		4	22	53	53		43	96	13	89	70	100			23				83	59	83	89	60	nd	nd	11				50	27
Cersus avium				8	23			9	15	11	30				5			100	29	3	17			nd	nd						35
Fagus sylvatica	100	100	100	100	100	100	100	20	2		30						67	100	29	4	50			nd	nd			25	33		
Fraxinus angustifolia																								nd	nd					100	
Fraxinus excelsior				17	55	66	10	22	52	35				7	85	85	33		100	100		11	100	nd	nd	11		25			55
Larix sp.								1	1															nd	nd						
Malus sylvestris								1						5	5									nd	nd						5
Picea abies		8		4				14	1					3					13					nd	nd				67		
Pinus sylvestris		Ī.	6	8	16			43	1	1				26					8					nd	nd		22				7
Populus tremula			į.	17	6		20	22	2	20		8		30	10				13		17			nd	nd	11	11				22
Pyrus communis								9	-	3					10	15						22	40	nd	nd		22				18
Quecus borealis				1					1	3				Ċ					Ċ					nd	nd	i.					
Quercus petraea			22	8			7			1	90			i.							33	100	80	nd	nd						
Quercus pubescens							6							Ċ										nd	nd	i.					
Quercus robur				19	15			90	73	82		83	25	92	88	92			58	25				nd	nd	33				83	65
Robinia pseudoacacia								3		4														nd	nd						
Salix alba																								nd	nd			50			2
Salix fragilis																								nd	nd						2
Salix caprea								1	1										4		33				nd						
Sorbus aucuparia								1																nd	nd						2
Sorbus torminalis							8															78	20	nd	nd						_
Tilia cordata				30	58		20	60	50	45	10	50	100	66	74	31			79	41	50			nd	nd	44				17	34
Tilia platyphyllos		Ċ				33										- '								nd	nd			1			
Ulmus glabra		33		24	49			11	23	13				10	14			100	79	57		-	20		nd	Ĺ					27
Ulmus laevis		00								1					6				, ,	٥,				nd	nd		44				
Ulmus minor								4	9	44				10	6	31			i					nd	nd	44	11			17	35

Abbreviations:

Adf – Athyrio distentifolii-Fagetum, ScF – Symphyto cordati-Fagetum, CF – Carpino-Fagetum, ShF – Stellario holostaeae-Fagetum, EVF – Euonymo verrucosae-Fagetum, SIF – Sesell libanotidis-Fagetum, LaF – Lathyro aurei-Fagetum, TC – Tilio-Carpinetum, IC – Isopyro thalictrodis-Carpinetum, GC – Galeobdolono lutei-Carpinetum, CpC – Carici pilosae-Carpinetum, CC – Ciricaeo-Carpinetum, AT – Acer platanoidis-Tilia cordata com., MQ – Merculaio perennis-Quercetur noboris, ShA – Stellario holostaeae-Aceretum platanoidis-Tilia TQ – Tulipo quercetorum-Quercetur noboris, AA – Auruco-Aceretum, PhA – Phyllitido-Aceretum, ANA – Anthrisco niticii-Aceretum pseudoplatani, ApF – Aceri platanoidis-Fraxinetum, BC – Bromopsio-Carpinetum, LC – Lasero trilobi-Carpinetum, RF – Ranunculo constantinopolitani-Fraxinetum, FAS – Fago-Aceretum stevenii, FA – Fraxino-Alnetum, AtA - Aceri tatarici-Alnetum, OA - Ornithogalo pontici-Alnetum, Ai - Alnetum incanae, PA - Piceo-Alnetum, FDU - Fraxino pannonicae-Ulmetum, FU - Ficario-Ulmetum campestris: nd - no data

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