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The vegetation of the upper and middle River Tiber (Central Italy)

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Abstract
The vegetation of the upper and middle course of the River Tiber (Tuscany and Umbria, Central Italy) was studied according to the phytosociological method. 39 different associations/communities included in 10 classes were identified, one new aquatic association and two new subassociations characterized by the occurrence of *Potamogeton schweinfurthii* were described. Some coenoses, dominated by species of scientific and conservation interest such as *Typha minima, Schoenoplectus pungens, Carex elata, Juncus subnodulosus* or *Isolepis cernua* were recognized. Despite the human pressures and the presence of some alien species, several Habitats in the study area are considered important for nature conservation by the European Directive 92/43/EEC or by the Regional Legislation.

Keywords: Aquatic vegetation, Hygrophilous vegetation, Phytosociology, Riparian vegetation, Wetland, River system.

Introduction

Over the last centuries, wetland habitats have suffered from a generalized impoverishment of flora and vegetation due to continuous direct and indirect anthropogenic alterations that have affected the main ecological factors responsible for species and communities distribution. Furthermore, the arrival and spreading of alien species constitute another important threat for wetland plant communities (Zedler & Kercher, 2004; Assini *et al*., 2009). The River Tiber in Tuscany and Umbria (Central Italy) is also affected by the influence of these factors. In particular, the construction of artificial ponds on the Upper Tiber Valley floodplain as a result of mining, the Montedoglio dam, canalization and regulation of the water regime have resulted in deep changes in the river system. Nevertheless, the interest in restoring, monitoring and increasing in value, in observance of the European Habitat Directive (92/43/EEC), strongly reflects the natural value of the vegetation of wet habitats. In the floodplain downstream of Montedoglio dam (Upper Tiber Valley, Tuscany) the Natural Protected Area of Local Interest (ANPIL) denominated "Golene del Tevere" (Anselmi, 2004) was founded. In Umbria two important Sites of Community Importance (SCI) were instituted: IT 5210003 "Fiume Tevere tra S. Giustino e Pierantonio" and IT 5210025 "Ansa degli Ornari".

The vegetation of the downstream part of the river was already investigated by Venanzoni & Gigante (2000), Ceschin & Salerno (2008). Here we report the analysis of vegetation of wetland habitats along the upper and middle course of the River Tiber and some of its tributaries.

Material and Methods

Study area

The study area includes the course of the River Tiber between Pieve S. Stefano (Arezzo, Tuscany) and Montemolino (Perugia, Umbria) and some of its tributaries (Fig.1). From the geological point of view, they run on substrata with different origins. The first stretch in Tuscany, between Pieve S. Stefano and Montedoglio, is characterized by the prevalence of alluvial deposits, calcareous-clay, flysch, intercalated with ultramafic soils. The second one located between Sansepolcro and Perugia is occupied on the river's right by siliciclastic sandstone with Tuscan affinity ("Macigno" and "Cervarola" formations, with the predominance of the siliceous component) and on the river's left by siliciclastic sandstone of Umbrian "Marnoso-Arenacea" formation and limestone. From Perugia to Montemolino the Tiber runs on Villafranchian deposits consisting of sands, gravel and clay (Regione Umbria, 2000). The study area is included in the temperate macro-region between the low and high-hilly bioclimatic belts (Venanzoni *et al*., 1998; Lastrucci *et al*., 2006), located at an altitude between 150 (Montemolino) and 500 m a.s.l. (Pieve S. Stefano).

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Data collecting and analysis

Vegetation was studied through 122 relevés carried out according to phytosociological method (Braun-Blanquet, 1932; Biondi, 2011; Pott, 2011). The phytocoenoses were described according to the principle of "local and physiognomic micro-homogeneity" (Géhu, 1988). The taxa recorded in the relevés were determined using "Flora d'Italia" (Pignatti, 1982) and "Flora Europaea" (Tutin *et al.*, 1968-1980, 1993) and recent taxonomic contributions. Species taxonomy was uniformed to the checklist of the web archiver for floristic and vegetation data "anArchive", updated to 7-02-2012 (Panfili *et al.*, 2004; http://www.anarchive.it/). Subspecies were indicated in the table only when they are different from the nominal subspecies or when one or several subspecies occur with the nominal one. A division was made with respect to the function of the dominant growth forms, so helophyte and terrestrial herbaceous communities were first separated from the true aquatic coenoses (see Arrigoni, 1996). The multivariate analysis was carried out on these two principal groups of phytocoenoses using the program SYNTAX 2000 (Podani, 2001), applying as distance measure the Chord and as group linkage method the Group Average (UPGMA) on a matrix transformed according to van der Maarel scale (van der Maarel, 1979). The nomenclature of syntaxa was determined from the comparison of specific literature (e.g. Grabherr & Mucina 1993; Schaminée *et al.*, 1995; Rivas-Martínez *et al.* 2001, 2002; Brzeg & Wojterska 2001; Chytrý, 2011), and by following the International Code of Phytosociological Nomenclature (Weber *et al.*, 2000). Descriptions of the ecological context of the communities in the study area were compared with the main European literature. All relevés are stored in the web database system anArchive (VegItaly project, Venanzoni *et al.*, 2012; Landucci *et al.*, 2012). Relevés sites are reported in the tables using the following shortenings: TS – Tract of River Tiber near Pieve S. Stefano (Tuscany); T – Tract of River Tiber downstream of Montedoglio dam

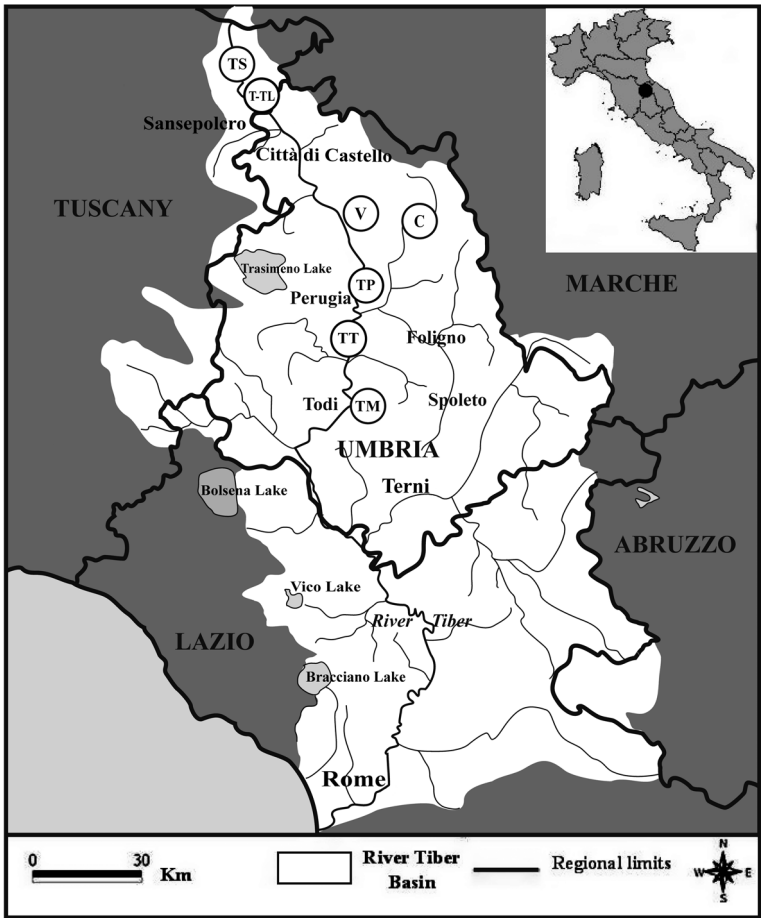

Fig. 1 - Study area; the stretches of River Tiber and the surveyed tributaries are listed as the following:
TS: River Tiber near Pieve S. Stefano (Tuscany); **T, TL**: River Tiber and artificial lakes downstream of Montedoglio dam (Tuscany); **V**: Stream Ventia; **C**: River Chiascio; **TP**: River Tiber near Ponte S. Giovanni (Umbria); **TT**: River Tiber near Torgiano (Umbria); **TM**: River Tiber near Montemolino.

(Tuscany); TL – artificial lakes along the River Tiber downstream Montedoglio dam (Tuscany); TP – River Tiber at Ponte S. Giovanni (Umbria); TT – River Tiber at Torgiano (Umbria); TM – River Tiber at Montemolino (Umbria); C – River Chiascio (Umbria); V – Stream Ventia (Umbria); MA: artificial lake near Monteroni d'Arbia (Siena, Tuscany). Sporadic species are listed in Appendix 1; relevés dates are listed in Appendix 2.

Results and Discussion

On the ground of the data analysis, 39 different associations/communities were recognized. Aquatic and helophytic-hygrophilous communities are identified by an alphabetic letter respectively in the dendrograms of Fig. 2 and Fig. 3. Fig. 2 shows the aquatic communities; 11 different groups are detected (Fig. 2 a-j). The helophytic and hygrophilous

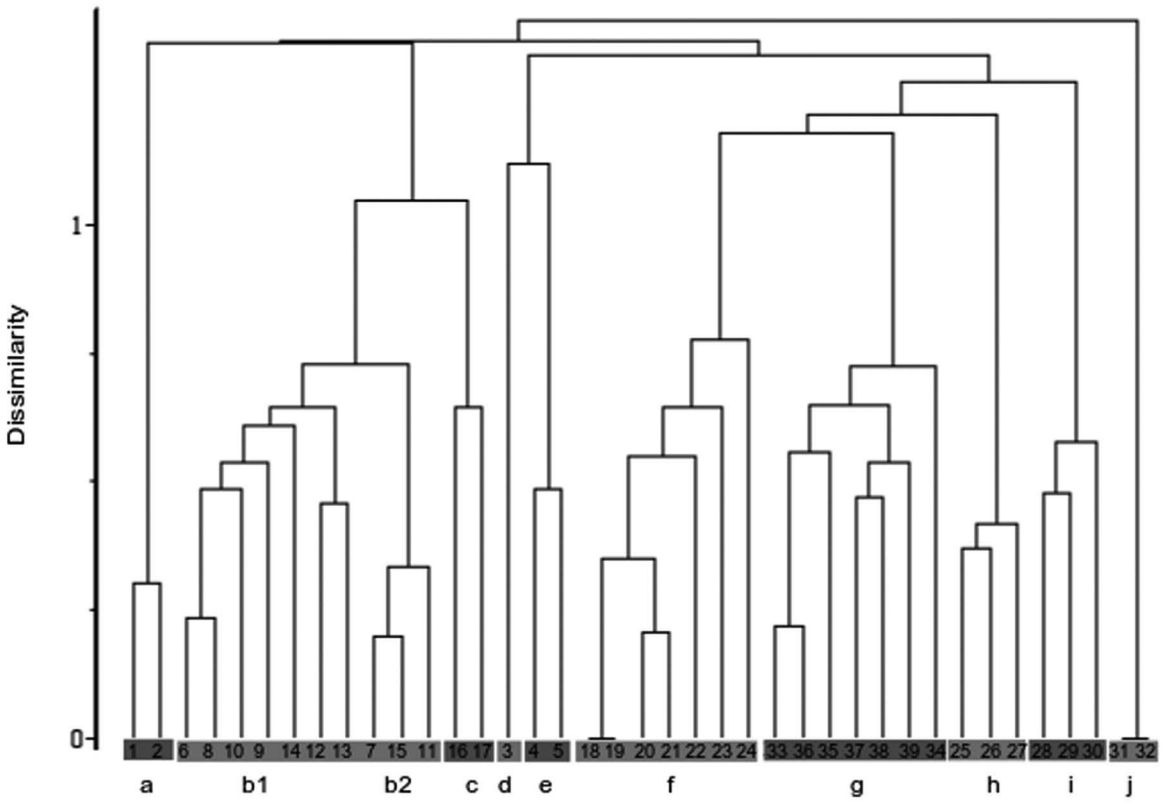

Fig.2 - Dendrogram of phytosociological relevés on aquatic communities

communities are shown in Fig. 3, where 26 groups are detected (Fig.3 a-z). In addition, 2 riparian woody communities were recognized.

STONEWORT PIONEER VEGETATION OF THE CLASS *CHARETEA FRAGILIS*

Charetum vulgaris Corillion 1957 (Table 1, relevés 1-2, Fig. 2a)

The association *Charetum vulgaris* grows on the floodplain in the Upper Tiber Valley and in some ponds near the Stream Ventia. This is described in literature as an association with a broad ecological range, occurring in different habitats, in slightly alkaline to alkaline water and from low to middle depth (see Hrivnák, 2002a, Hrivnák *et al*., 2005).

PLEUSTONIC VEGETATION OF THE CLASS *LEMNETEA*

Lemna minor community (Table 1, relevé 3, Fig. 2d) Vegetation dominated by *Lemna minor* was observed in a depression with an artificial bottom below a check dam near Montemolino. According to Scoppola (1982), Pott (1995) and Sburlino *et al*. (2004) we consider this coenosis of *Lemna minor* as basal-phytocoenon.

Ceratophylletum demersi Corillion 1957 (Table 1, relevés 4-5, Fig. 2e)

Dense stands dominated by *Ceratophyllum demersum* occur along the Tiber river near Montemolino, growing

Table 1 - Aquatic vegetation (classes *Charetea fragilis*, *Lemnetea* and *Potametea*); Rel. 18: holotypus of *Potametum schweinfurthii* ass. nova hoc loco *potametosum schweinfurthii* subass. nova; Rel. 23 holotypus of *Potametum schweinfurthii* ass. nova hoc loco *najadetosum marinae* subass. nova.

Relevé 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	
Number in the cluster (Fig. 2)	1	2	3	4	5	33	36	35	37	38	39	34	16	17	6	8	10	9	14	12	13	7	15	11	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
Locality	TL	V	TM	TM	TM	TL	C	T	TP	TM	TM	T	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	MA	TL	TP	TP	TM	TM	TM	TL	TP	TL	TL	TL	TL	TM	C	TP	
Surface (m²)	6	3	2	10	6	12	4	2	3	3	14	2	10	6	6	4	6	6	6	8	6	4	10	6	6	1	3	5	4	2	6	2	10	10	2	2	2	1	1	
Total cover (%)	100	100	100	100	100	85	95	100	90	75	70	80	100	100	85	90	90	90	90	95	100	90	100	80	65	100	100	90	100	80	100	100	100	100	100	100	95	90	100	Presences
Charact. of association or dominant species																																								
Chara vulgaris L.	5	5	.	.	.	+	2	.	.	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	7
Lemna minor L.	.	.	5	2	1	.	.	.	.	.	r	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	6
Ceratophyllum demersum L.	.	.	.	5	5	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Potamogeton nodosus Poir.	.	.	.	+	+	5	5	5	5	5	4	4	1	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	2	.	2	+	.	+	.	.	1	.	.	16
Najas marina L.	.	.	.	.	.	.	.	.	.	.	.	.	4	5	2	1	.	1	2	3	1	4	5	4	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	12
Potamogeton schweinfurthii A. Benn.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	5	5	5	4	4	5	2	2	2	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	11
Stuckenia pectinata (L.) Börner	.	.	.	.	+	.	.	.	.	2	1	1	.	.	.	.	.	.	.	+	.	.	.	1	4	5	5	5	5	4	4	.	.	.	1	1	.	.	.	15
Myriophyllum spicatum L.	.	.	.	+	.	.	2	.	.	.	+	2	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	1	3	5	5	5	.	.	.	.	.	12
Potamogeton pusillus L.	.	.	.	.	.	.	1	.	.	.	.	.	3	+	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5	5	5	.	.	9
Potamogeton crispus L.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	5	5	4
Other species																																								
Mentha aquatica L.	.	.	.	.	.	.	+	1	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	5
Alisma plantago-aquatica L.	+	.	.	.	.	.	.	1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	4
Cyperus fuscus L.	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Paspalum distichum L.	.	.	.	.	.	.	.	.	.	+	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Ranunculus repens L.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Schoenoplectus pungens (Vahl) Palla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Typha latifolia L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	2
Sporadic species	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	

on still or slowly moving water, at a depth of 50 cm. *C. demersum* is a species with broad ecological range and it is considered as an indicator of water rich in nutrients and eutrophic conditions (Sburlino *et al*., 2004; Ceschin & Salerno, 2008; Ceschin *et al*., 2010). In the study area, *C. demersum*, was accompanied by a discontinuous layer of *Lemna minor* and few other species. We refer this kind of vegetation to the association *Ceratophylletum demersi* Corillion 1957 (see Šumberová 2011a for nomenclatural notes) and to the class *Lemnetea* (alliance *Hydrocharition morsus-ranae*), according to many European authors (e.g. Schratt, 1993a; Oťaheľová, 1995; Šumberová, 2011a). The syntaxonomical treatment of the alliance *Hydrocharition* follows Landucci *et al*. (2011).

ROOTING VEGETATION OF THE CLASS *POTAMETEA*

Potametum denso-nodosi de Bolós 1957 (Table 1, relevés 6-12, Fig. 2g)

Vegetation dominated by *Potamogeton nodosus* is rather widespread along the whole course of both the rivers Tiber and Chiascio. It grows in water with moderate to strong current but it was also found in some artificial ponds of the floodplain in the Upper Tiber Valley. The water depth varies from a few centimetres to more than one metre. *Potametum denso-nodosi* was recognized also in other wetlands of Central Italy (Landucci *et al*., 2011) and *P. nodosus* dominated vegetation was also found in the lower course of the Tiber (Ceschin & Salerno, 2008). *P. nodosus* vegetation is considered an indicator of eutrophic water of medium quality (see Ceschin *et al*., 2010).

Najadetum marinae Fukarek 1961 (Table 1, relevés 13-14, Fig. 2c)

The association *Najadetum marinae* was detected in artificial lakes generated for excavation in the floodplain, downstream of Montedoglio dam. The association is present also for the lower course of River Tiber (Ceschin & Salerno, 2008). From a syntaxonomic point of view, some authors (e.g. Schratt, 1993b, Sburlino *et al*., 2008) distinguish this association from the *Potamo-Najadetum marinae* Horvatič et Micevski in Horvatič 1963, which is characterized by the occurrence of many species of *Magnopotamion* (such as *P. perfoliatus, P. lucens*, etc…) and grows on less fine-grained soil (Sburlino *et al*., 2008). However the independence of this association is not widely accepted (e.g. Schipper *et al*., 1995, Šumberová, 2011b).

Potametum schweinfurthii ass. nova (Table 1, relevés 15-24, holotypus rel. 18) subass. *potametosum schweinfurthii* subass. nova (holotypus Table 1, relevé 18, Fig. 2b1) and subass. *najadetosum marinae* (holotypus Table 1, relevé 23, Fig. 2b2)

Potamogeton schweinfurthii was first reported in Southern Europe by Kaplan (2005) and in the Italian Peninsula by Lastrucci *et al*. (2010a). Vegetation characterized by this species was observed in several artificial lakes in the floodplain of Upper Tiber Valley and also in the other Tuscan site of *P. schweinfurthii* (Monteroni d'Arbia, Siena, Table 1, rel. 24). It grows on medium/fine-grained sediments and ranges from a few centimeters to over one meter water deep and it is rather poor in species. We describe this kind of vegetation with the new association *Potametum schweinfurthii*, of the alliance *Potamion*. In the study area, the association presents two aspects: the typical, with dominance of *P. schweinfurthii* that we can refer to the new subass. *potametosum schweinfurthii* (holotypus Table 1, rel. 18) and a type dominated by *Najas marina* (subass. *najadetosum marinae*, holotypus Table 1, rel. 23) interpretable as a transitional aspect towards *Najadetum marinae*.

Potametum pectinati Carstensen ex Hilbig 1971 (Table 1, relevés 25-31, Fig. 2f)

The association *Potametum pectinati* is rather diffuse through the study area and is present also along the lower course of the River Tiber (Ceschin & Salerno, 2008). This association is largely tolerant of high organic loads and for this reason it is considered as an indicator of hypertrophic water of poor quality (Ceschin *et al*., 2010).

Potamo pectinati-Myriophylletum spicati Rivas Goday 1964 corr. Conesa 1990 (Table 1, relevés 32-34, Fig. 2h)

Relevés dominated by *Myriophyllum spicatum* were assigned to the association *Potamo pectinati-Myriophylletum spicati*, typical of the lower courses of large rivers, of eutrophic and calcareous water (Loidi *et al*., 1997). The association is considered as poor quality water indicator (Ceschin *et al*., 2010). This association covers large surfaces of still water such as some artificial ponds of the Upper Tiber Valley floodplain and it occurs in the river course, in flowing water, where it forms small and almost monospecific stands. In the study area this community grows in medium deep water and it is stable, not dynamically evolving into other associations (e.g. *Nymphaeo albae-Nupharetum luteae* Nowiński 1927) as underlined also by Ceschin & Salerno (2008) for the lower course of the Tiber river. The attribution of the *M. spicatum* communities to *Potamion* alliance follows many European and Italian Authors (e.g. Felzines, 1983; Pedrotti, 1991; Golub *et al*., 1991; Loidi *et al*., 1997; Brzeg & Wojterska, 2001; Sburlino *et al*., 2008; Lastrucci *et al*., 2010b; Šumberová, 2011b).

Potametum pusilli Soó 1927 (Table 1, relevés 35-37, Fig. 2i)

Coenoses dominated by *Potamogeton pusillus* were observed in two ponds of the floodplain in the Upper Tiber Valley. They are represented by small and species-poor stands, where *P. pusillus* shows a high cover value. Communities dominated by *P. pusillus* were recorded recently also by Lastrucci *et al*. (2008) and Landucci *et al*. (2011) respectively in Tuscany and Umbria.

Potamogeton crispus community (Table 1, relevés 38-39, Fig. 2j)

Small monospecific communities of *Potamogeton crispus* were detected along the River Chiascio and the River Tiber at Ponte S. Giovanni. These stands could be considered as fragments of the association *Potametum crispi* Soó 1927, which is a species-poor community of still to slowly running water (Felzines, 1983; Hrivnák, 2002b; Biondi *et al*., 2009).

PIONEER VEGETATION OF HYGRO-NITROPHILUS THEROPHYTES OF THE CLASS *BIDENTETEA TRIPARTITAE*

Polygonetum hydropiperis Passarge 1965 (Table 2, relevés 1-3, Fig. 3)

The vegetation dominated by annual hygro-nitrophilous species like *Persicaria hydropiper* and the alien species *Bidens frondosus* was referred to the association *Polygonetum hydropiperis* (see Kiesslich *et al*., 2003). It grows on muddy and sandy soils flooded during the most part of the year, subject to drying out during the summer and remains until the next flooding during the autumn. Some relevés, carried out at Montemolino, show the occurrence of *Bidens connatus*, alien species less widespread across Italy than *B. frondosus* (Celesti-Grapow *et al*., 2009, 2010).

Cyperetum esculenti Wisskirchen 1995 (Table 2, relevés 4-5, Fig. 3b)

Cyperus esculentus is a doubtful alien species (Celesti-Grapow *et al*., 2009) found along the banks or in the external parts of some river islets along the Umbrian tract of Tiber. Our relevés show some affinities with the association *Cyperetum esculenti* described by Wisskirchen (1995) from Southwest France. This association assumes for the study area the role of pioneer vegetation, growing in gravelly-pebbly river bars with a minimum deposit of sand, and subject to drying out in the summer and where the accumulation of sediment plays a key role in the establishment of vegetation.

Polygono lapathifolii-Xanthietum italici Pirola et Rossetti 1974 (Table 2, relevés 6-8, Fig. 3c)

This vegetation type mainly occurs along riverbanks or islets of the rivers Tiber and Chiascio in Umbria, on sandy to pebbly-gravel soil. Our relevés show both an aspect with low coverage values, as reported by Biondi & Baldoni (1994), and an increase in the cover values of *Xanthium orientale* subsp. *italicum* in relation to the decrease of sediment granulometry. The association was found also along the lower course of Tiber (Ceschin & Salerno, 2008).

ANNUAL WETLAND VEGETATION OF THE CLASS *ISOËTO-NANOJUNCETEA*

Cyperus fuscus community (Table 2, relevés 9-14, Fig. 3f)

Vegetation dominated by *Cyperus fuscus* occurs on the muddy shores, emerging from the water during the summer around ponds and lakes or along riverbanks of the Tiber and some of its tributaries. This kind of vegetation is favoured by disturbance conditions and bank remodelling (Ceschin & Salerno, 2008; Venanzoni & Gigante, 2000). Our relevés show a scarce presence of other therophytes of the class *Isoëto-Nanojuncetea,* such as *Juncus bufonius*. More often the dominant species is accompanied by a large contingent of species of other classes such as *Phragmito-Magnocaricetea, Bidentetea* and *Molinio-Arrhenathereta*, as already reported by Ceschin & Salerno (2008) and Venanzoni & Gigante (2000).

Isolepis cernua community (Table 2, relevé 15, Fig. 3m)

A community dominated by *Isolepis cernua* was detected in a depression at the edge of the Tiber bank, just south of the Montedoglio dam. This vegetation type was already recorded in wetland in the Upper Tiber Valley (Lastrucci *et al*., 2006), where it seems to find some habitats suitable to its ecological requirements. *I. cernua* is indicated by some authors as a characteristic of the order *Isoëtetalia* (Brullo & Minissale, 1998), while by others it is included among the characteristic species of the alliance *Nanocyperion* of the order *Nanocyperetalia* (Rivas-Martínez *et al*., 2002). Due to its ecological requirements and the summer life-cycle in the study area, we prefer to attribute this community to the alliance *Nanocyperion*.

HELOPHYTE COMMUNITIES OF THE CLASS *PHRAGMITO-MAGNOCARICETEA*

Phragmitetum australis Savič 1926 (Table 2, relevés 16-19, Fig. 3v)

This species-poor association with wide geographic distribution is typical of mesotrophic to eutrophic water bodies with muddy soil (Venanzoni & Gigante, 2000). It is widespread along the whole course of the

river (see also Ceschin & Salerno, 2008) and along the excavation ponds shores on the floodplain near Montedoglio dam. For the nomenclature we followed the revision applied by Šumberová *et al*. (2011).

Phragmito-Typhetum minimae Trinajstic 1964 (Table 2, relevés 20-23, Fig. 3q)

The association *Phragmito-Typhetum minimae* Trinajstic 1964, is spread along the flooded riverbanks of the Tiber in the Upper Tiber Valley, in conditions of moderate current speed. It also occurs in depressions and ponds lateral to the main course of the river, characterized by stagnant water. The association is also indicated for other Italian rivers (Biondi *et al*., 1997, 1999; Biondi & Baldoni, 1994; Scoppola, 1998; Pirone, 1991). Even though this community in the study area is in close contact with *Phragmitetum australis, T. minima* and *P. australis* scarcely interpenetrate each other, as emphasized also by Biondi & Baldoni (1994) and Scoppola (1998). The species composition and the ecology of our relevés differ from those of the association *Mentho acquaticae-Typhetum minimae* described for the Stream Fiumicello by Venanzoni & Gigante (2000), where *T. minima* grows on a layer of vegetal matter which raises this community from the bank level.

Typhetum latifoliae Nowiński 1930 (Table 2, relevés 24-25, Fig. 3r)

This association occurs in the Upper Tiber Valley floodplain, both around a flooded area of excavation and along the riverbanks. The association grows on muddy soil, covered by a layer of at least 10 cm of water even during the summer. The association is also recorded for the lower course of the Tiber (Ceschin & Salerno, 2008).

Eleocharitetum palustris Savič 1926 (Table 2, relevés 26-28, Fig. 3p)

Vegetation dominated by *Eleocharis palustris* was detected both along the River Tiber course and on the pond shores in the floodplain of the Upper Tiber Valley. In both cases the species was found on the muddy banks emerging during the summer. The coenoses dominated by *Eleocharis palustris* are usually species poor and show a typical pioneer behaviour (Venanzoni & Gigante, 2000; Lastrucci *et al*. 2007).

Schoenoplectus pungens community (Table 2, relevés 29-33, Fig. 3o)

Schoenoplectus pungens is a species rather rare in Italy, where it is distributed mainly in the wetlands along the coasts. The most inland record within the study area (Tuscany and Umbria) came from Trasimeno Lake (Pignotti, 2003; Gigante *et al*., 2009). *S. pungens* grows both in stagnant and running water from oligo-mesotrophic to mesoaline conditions and it is tolerant to a broad water level range (Vanden Berghen, 1967). In situations of greater depth, *S. pungens* forms stands consisting almost exclusively of individuals with submerged cauline leaves and rare emerging flowering stems, as also determined in the study area.

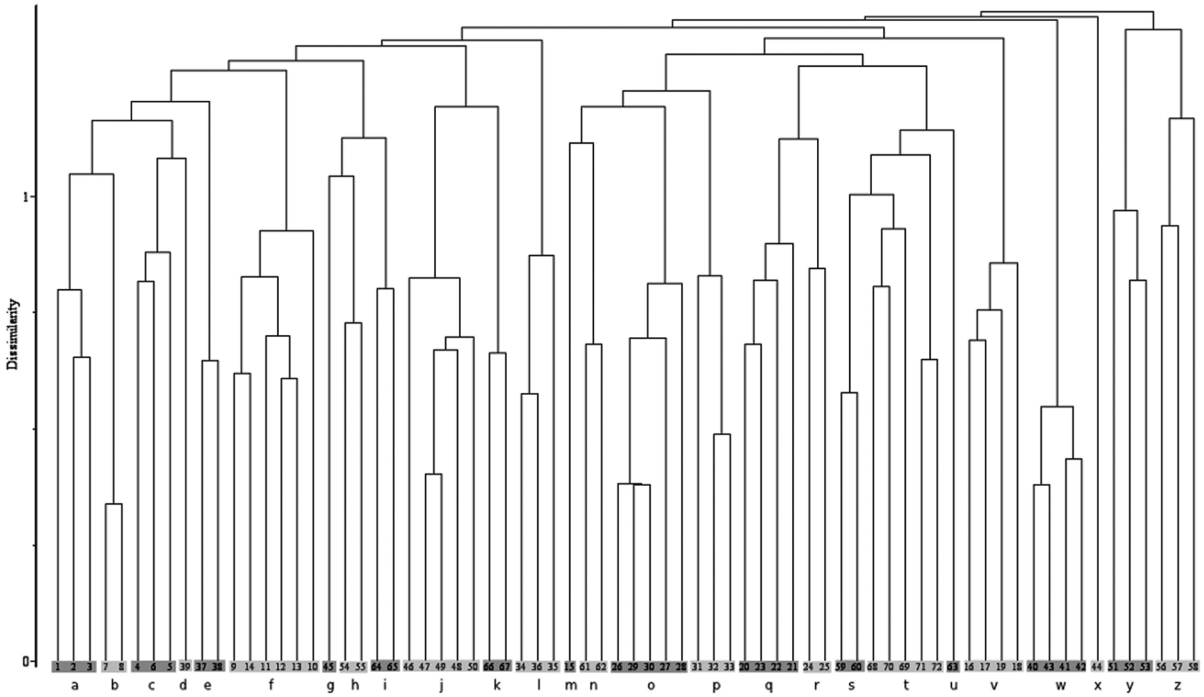

Fig. 3 - Dendrogram of phytosociological relevés on helophyte and terrestrial herbaceous communities

Vanden Berghen (1967) reported several relevés on ecologically different communities characterized by the presence of *S. pungens* under the name *Scirpetum pungentis*. According with the original interpretation of Corillion (1950), Loidi *et al.* (1997) assigned the name *Scirpetum pungentis* (Corillion 1950) Vanden Bergen 1967 to subhalophilous communities of central-northern Spain and included the association in the *Scirpion maritimo-compacti* alliance.

This syntaxonomical treatment is unsuitable for the study area, where the vegetation dominated by *S. pungens* was found on loamy-clayey bottoms of an artificial freshwater pond along Tiber River in the Upper Tiber Valley. This vegetation occupies an intermediate position between the aquatic coenoses of *Charetea* and *Potametea* and the helophytic/ hygrophilous coenoses of *Phragmito-Magnocaricetea, Bidentetea* and *Isoëto-Nanojuncetea*. Few pioneer species, such as *Juncus articulatus* and *Eleocharis palustris* accompany *S. pungens* in the study area, whereas *Potamogeton schweinfurthii* and *Chara sp.* testify the contact with hydrophytic vegetation. Due to the lack of phytosociological data about this kind of community in Italy, here we prefer to treat this kind of vegetation as *S. pungens* community, including it in the alliance *Eleocharito-Sagittarion* according to ecology of the habitat.

Sparganietum erecti Roll 1938 (Table 2, relevés 34-36, Fig. 3l)

Stands dominated by *Sparganium erectum* occur in conditions of moderate fluctuations of water level and moderate current. The association is rather common in Northern and central Italy (Ceschin & Salerno, 2008), while it is rarer in the South (Brullo *et al.*, 1994; Maiorca *et al.*, 2007). Buchwald (1994) evidences the intermediate position of the association between the alliances *Phragmition* and *Glycerio-Sparganion*; here we refer the association to the alliance *Glycerio-Sparganion*, according to Molina (1996) and Venanzoni & Gigante (2000).

Leersietum oryzoidis Eggler 1933 (Table 2, relevés 37-38, Fig. 3e)

The association occurs both in the upper course of the Tiber, and more often along the middle course of the river, where it seems to find more suitable conditions with the increased soil trophic level. We include the association in the *Glycerio-Sparganion* alliance according to various Authors (Philippi, 1977; Brzeg & Wojterska, 2001; Hrivnák, 2002c; Makra, 2005; Stančič, 2007; Šumberová *et al.* 2011), although this collocation is not univocally accepted (see Balátová-Tuláčková *et al.*, 1993). In Italy this association was reported mainly from the North-East (see Marchiori & Sburlino, 1996; Prosser & Sarzo, 2003; Tomasi *et al.*, 2004) and from Metauro river (Biondi *et al.*, 2007). *Leersietum oryzoidis* often occurs in contact with associations of the alliance *Bidention* as recorded also by other Authors (Balátová-Tuláčková *et al.*, 1993; Prosser & Sarzo, 2003) and some authors attributed several stands dominated by *L. oryzoides* to the association *Bidenti-Leersietum oryzoides* Poli et J. Tx. 1960 including it in the alliance *Bidention tripartitae* (Zaliberová *et al.* 2000). The autonomy of this association is however not accepted by all Authors (see Šumberová *et al.* 2011).

Nasturtietum officinalis Gilli 1971 (Table 2, relevés 39-42, Fig. 3w)

Nasturtium officinale-dominated coenoses are typical of running water, where they occur in advanced position into the stream, ahead of the coenoses of tall emergent plants, which favour a lower water level (Baldoni & Biondi, 1993; Biondi *et al.*, 2009). In the study area this type of vegetation shows high values of coverage with the strong dominance of *Nasturtium officinale* and with a rather poor floristic cortege. Coenoses of *N. officinale* were reported also for the terminal course of the Tiber River by Ceschin & Salerno (2008). The nomenclature follows Šumberová *et al.* (2011).

Rorippo-Phalaridetum arundinaceae Kopecký 1961 (Table 2, relevé 43, Fig. 3d)

Phalaroides arundinacea-dominated vegetation is uncommon in the study area and it is found in only one site. Although the detected stand had a small size, the habitat type and the occurrence of a good contingent of hygro-nirophilous species argue in favour of attributing this community to the association *Rorippo-Phalaridetum arundinaceae*, as suggested by Hrivnák & Ujházy (2003) and Lastrucci *et al.* (2010c). The closeness of this association to hygro-nitrophilous coenoses is also shown by the cluster analysis (Fig. 3).

Galio palustris-Juncetum inflexi Venanzoni et Gigante 2000 (Table 2, relevé 44, Fig. 3x)

Juncus inflexus-dominated community occurs around some man-made ponds in the floodplain of the Upper Tiber Valley, near shores submerged for long time. This vegetation can be attributed to the association *Galio palustris-Juncetum inflexi* described from Lake Alviano by Venanzoni & Gigante (2000) and placeable within the alliance *Magnocaricion*. The association indicates the contact between the marsh phytocoenoses and the meadows of the class *Molinio-Arrhenatheretea*.

Cyperetum longi Micevski 1957 (Table 2, relevé 45, Fig. 3g)

The association *Cyperetum longi* Micevski 1957 grows on grassy banks of the medium Tiber. The

floristic composition of the community shows the transitional position of *Cyperetum longi* between the more hygrophilous associations of the alliance *Magnocaricion* and the wet meadows of the *Plantaginetalia* order (see also Venanzoni & Gigante, 2000).

Eupatorio cannabini-Caricetum elatae Biurrun, J.A. Molina et Loidi in Biurrun 1999 (Table 2, relevés 46-50, Fig. 3j)

Vegetation dominated by *Carex elata* was detected along the river Chiascio (Umbria). From an ecological point of view this vegetation is different from *Caricetum elatae* Koch 1926, which is more related to the marshy areas with stronger water level fluctuations (Venanzoni & Gigante, 2000). It shows similarities with the association *Eupatorio cannabini-Caricetum elatae* reported from some rivers of Navarra (Spain) by Biurrun (1999). The occurrence of this association is connected with situations of more or less strong flowing water and conditions of partial shading of riparian forest (Biurrun, 1999).

TALL HYGRO-NITROPHILOUS HERB VEGETATION OF THE CLASS *GALIO-URTICETEA*

Phalarido-Petasitetum hybridi Schwick. 1933 (Table 3, relevés 1-3, Fig. 3y)

This nitrophilous association of riverbanks was detected along the floodplain of the Tiber at the margin of the riparian forests, as reported also by Baldoni & Biondi (1993) or Lastrucci *et al*. (2010c) in Central Italy. Sometimes it grows in contact with cultivated areas behind the river determining a marked synanthropic imprint (see Pedrotti, 1995). Physiognomically, in the study area, this vegetation type is characterized by a strong coverage of *Petasites hybridus*. The species of higher syntaxa are infrequent, but sometimes species that come from riparian forests such as *Brachypodium sylvaticum, Arum italicum* and *Solanum dulcamara* occur.

Calystegio-Asteretum lanceolati (Holzner *et al*. 1978) Passarge 1993 (Table 3, relevés 4-5, Fig. 3h)

Symphyotrichum lanceolatum is an alien species, native of North America and so far unrecorded in Umbria (Conti *et al*., 2005, 2007; Celesti-Grapow *et al*., 2010). This species forms coenoses that grow on the banks and rise from the water level, rarely flooded, in contact with the vegetation of the escarp behind. From the syntaxonomic point of view this vegetation can be assigned to the association *Calystegio-Asteretum lanceolati* of the order *Convolvuletalia*. From the comparison with Central European (Schubert, 2001) and Italian surveys (see also Lastrucci *et al*., 2010c), the association is characterized by a mingling of hygro-nitrophilous species and others more distinctly hygrophilous ones, represented in our relevés by *Lytrhum salicaria, Lysimachia vulgaris* and *Leersia oryzoides*.

XEROPHILOUS VEGETATION OF THE DRY PEBBLY RIVERBANK OF THE CLASS *FESTUCO-BROMETEA*

Peucedano verticillaris-Ononidetum natricis Biondi et Baldoni 1994 (Table 3, relevés 6-8, Fig. 3z)

This vegetation can be found in the more xerophilous areas of the river banks on stony-sandy substrate. In this kind of habitat we observed the occurrence of a vegetation characterized by the presence of *Ononis natrix* and, more rarely, *Tommasinia verticillaris,* that can be attributed to the association *Peucedano verticillaris-Ononidetum natricis* Biondi et Baldoni 1994. Also in the study area the association is in contact with *Salix eleagnos* communities, as reported by Biondi & Baldoni (1994) for the River Marecchia.

HYGROPHILOUS VEGETATION OF WET MEADOWS OF THE CLASS *MOLINIO-ARRHENATHERETEA*

Holoschoenetum vulgaris Br.-Bl. ex Tchou 1948 (Table 3, relevés 9-10, Fig. 3s)

The vegetation dominated by *Scirpoides holoschoenus* is rather common in the floodplain of the Upper Tiber Valley, where it grows on fluvial islets, in the depressions fed by ground water, that flank the river or the shores of some quarry ponds. Our relevés can be attributed to the association *Holoschoenetum vulgaris*, already reported from Central Italy (Biondi & Baldoni, 1994; Orsomando & Catorci, 1991; Lastrucci *et al*., 2006). The association grows tipically on fine-grained to sandy, permeable deep and moist soils (Tchou, 1948). In the study area it grows upstream of the helophytes formations of *Phragmition*, occupying areas that are flooded for short periods during the year. In the relevés the occurrence of *Epipactis palustris* is constant, highlighting the conditions of high humidity of the substrate growing widely in depressed areas marginal to the river.

Juncus subnodulosus community (Table 3, relevés 11-12, Fig. 3n)

Vegetation dominated by *Juncus subnodulosus* occurs in one site near the Stream Ventia. *J. subnodulosus* communities were subjected to several syntaxonomic treatment and attributed to several

Table 3 - Vegetation of the classes *Galio-Urticetea*, *Festuco-Brometea* and *Molinio-Arrhenatheretea*

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Number in the cluster (Fig. 3)	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	70	69	71	72	
Locality	T	TS	C	TT	TT	T	T	T	T	T	V	V	T	TS	TS	C	C	T	T	T	V	V	
Surface (m²)	4	4	12	10	5	8	6	6	9	15	20	10	4	4	4	1	1	6	4	6	10	2	
Total cover (%)	100	90	95	100	90	80	60	55	100	100	100	80	80	100	95	90	95	100	100	100	100	100	Presences
Charact. and diff. (d) of association or dominant species																							
Petasites hybridus (L.) G. Gaertn., B. Mey. et Scherb.	5	5	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	5
Symphyotrichum lanceolatum (Willd.) G.L. Nesom	.	.	.	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Calystegia sepium (L.) R. Br.	.	+	+	+	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	5
Ononis natrix L.	.	.	.	.	.	3	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Galium album Mill. (d)	1	.	.	.	.	r	+	+	+	.	.	.	+	.	.	.	.	.	+	+	+	.	9
Tommasinia verticillaris (L.) Bertol.	2	.	.	.	.	r	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Prunella vulgaris L. (d)	.	.	.	.	.	r	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	4
Scirpoides holoschoenus (L.) Soják	.	.	.	.	.	.	.	.	4	4	1	1	+	.	.	.	.	+	1	1	.	.	8
Juncus subnodulosus Schrank	.	.	.	.	.	.	.	.	.	.	5	3	.	.	.	.	.	.	.	.	.	.	2
Schoenus nigricans L.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	1
Agrostis stolonifera L.	.	.	.	2	3	.	.	.	1	1	.	2	.	5	5	+	1	.	.	1	.	.	10
Rorippa sylvestris (L.) Besser	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	2
Rorippa x anceps (Wahlenb.) Rchb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	5	.	.	.	.	.	2
Eupatorium cannabinum L.	.	.	.	.	.	.	.	.	2	+	+	.	2	.	.	.	.	3	3	2	3	3	9
Cirsium creticum (Lam.) d'Urv. subsp. triumfettii (Lacaita) K. Werner	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	3	3	5	1	.	5
Charact. *Galio-Urticetea*																							
Pastinaca sativa L.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	1	.	.	.	.	4
Tussilago farfara L.	.	1	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	4
Rubus caesius L.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	3
Aegopodium podagraria L.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Galega officinalis L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Urtica dioica L.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Charact. Festuco-Brometea																							
Bromopsis erecta (Huds.) Fourr.	.	.	.	.	.	1	1	+	.	.	.	.	1	.	.	.	.	.	.	.	.	.	4
Knautia arvensis (L.) Coult.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	3
Lotus hirsutus L.	.	.	.	.	.	r	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Odontites luteus (L.) Clairv.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Sanguisorba minor Scop.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Brachypodium rupestre (Host) Roem. et Schult.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Centaurea jacea L. subsp. gaudinii (Boiss. et Reut.) Gremli	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Hypericum perforatum L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Plantago sempervirens Crantz	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Scabiosa columbaria L.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Charact. *Molinio-Arrhenatheretea*																							
Pulicaria dysenterica (L.) Bernh.	.	.	.	.	.	.	.	.	3	2	+	+	1	.	+	.	.	2	2	1	+	1	11
Potentilla reptans L.	1	.	.	1	.	.	.	.	+	.	.	+	.	.	.	.	1	.	.	1	.	+	7
Centaurea nigrescens Willd. subsp. pinnatifida (Fiori) Dostál	.	.	.	.	.	+	+	.	1	1	.	.	+	.	.	.	.	.	+	.	.	.	6
Juncus articulatus L.	.	.	.	.	.	.	.	.	.	+	+	2	.	1	.	.	.	.	.	.	+	.	5
Plantago major L.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	1	+	5
Juncus inflexus L.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	.	.	.	.	.	+	+	.	4
Epipactis palustris (Mill.) Crantz	.	.	.	.	.	.	.	.	3	3	.	.	.	.	.	.	.	.	1	.	.	.	3
Molinia caerulea (L.) Moench subsp. arundinacea (Schrank) K. Richt.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	3	3	3
Ranunculus repens L.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	3
Carex flacca Schreb.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	2	.	.	.	2
Holcus lanatus L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	2

Hypericum tetrapterum Fr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	2
Lotus tenuis Waldst. et Kit. ex Willd.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	2
Rumex crispus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	2
Teucrium scordium L. subsp. scordioides (Schreb.) Arcang.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	2
Carex distans L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
Dactylis glomerata L.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Equisetum palustre L.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1
Lolium perenne L.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1
Lysimachia nummularia L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Paspalum distichum L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Plantago lanceolata L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
Rumex conglomeratus Murray	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1
Schedonorus arundinaceus (Schreb.) Dumort.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1
Other species																						
Mentha aquatica L.	.	.	.	.	.	.	.	.	2	2	3	3	1	1	1	.	.	2	.	2	2	2	11
Brachypodium sylvaticum (Huds.) P. Beauv.	3	.	.	+	1	.	1	.	.	+	.	.	1	.	.	.	.	1	2	.	2	2	10
Carex pendula Huds.	.	.	.	1	.	.	.	.	+	+	.	.	+	.	.	.	.	.	+	1	1	+	8
Clematis vitalba L.	1	+	+	.	.	2	r	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	7
Lycopus europaeus L.	.	.	.	+	.	.	.	.	.	.	2	.	+	.	.	.	1	+	1	.	.	2	7
Lythrum salicaria L.	.	.	.	1	1	.	.	.	1	1	.	.	.	.	.	.	1	.	.	1	.	.	6
Salix purpurea L.	.	+	.	.	.	.	.	.	2	1	.	.	1	.	.	.	.	1	+	.	.	.	6
Bidens frondosus L.	.	.	.	2	1	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	5
Populus nigra L.	.	1	.	.	.	1	r	.	+	.	.	.	.	.	.	.	.	1	.	.	.	.	5
Dittrichia viscosa (L.) Greuter	.	.	.	.	.	2	2	.	.	.	.	.	1	.	.	.	.	+	.	.	.	.	4
Equisetum arvense L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	2	.	.	4
Salix eleagnos Scop.	.	.	.	.	.	.	2	.	.	.	.	.	3	.	.	.	.	2	.	+	.	.	4
Alnus glutinosa (L.) Gaertn.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	3
Daucus carota L.	.	.	.	.	.	1	r	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	3
Equisetum ramosissimum Desf.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	3	.	.	3
Carex elata All.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	2
Cornus sanguinea L. s.l.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2
Cota tinctoria (L.) J. Gay	.	.	.	.	.	.	r	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Echium vulgare L.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Galeopsis ladanum L. subsp. angustifolia (Ehrh. ex Hoffm.) Gaudin	.	.	.	.	.	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Geranium rotundifolium L.	.	.	.	.	.	r	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	2
Lysimachia vulgaris L.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	2
Petrorhagia prolifera (L.) P.W. Ball et Heywood	.	.	.	.	.	r	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Phragmites australis (Cav.) Steud.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	2
Rubus ulmifolius Schott	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	2
Salix alba L.	.	.	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	2
Typha minima Funk	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	2
Xanthium orientale L. subsp. italicum (Moretti) Greuter	.	.	.	+	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	2
Sporadic species	2	1	2	3	0	9	5	2	0	0	0	1	1	7	1	0	0	0	1	0	1	1	

alliances i.e. *Caricion davallianae* Klika 1934 (Hájek & Hájková, 2011), *Magnocaricion* (Philippi, 1977; Stančič, 2007) or *Molinio-Holoschoenion* (Venanzoni & Gigante, 2000). The syntaxonomic treatment of Venanzoni & Gigante (2000) follows some Spanish Authors (e.g. Loidi *et al*., 1997), which consider this species characteristic of *Holoschoenetalia* order (see also Rivas-Martínez *et al*., 2002). The presence of a rich species group of *Molinio-Arrhenatheretea* and *Holoschoenetalia* such as *Scirpoides holoschoenus, Pulicaria dysenterica, Juncus articulatus,* and *Teucrium scordium* subsp. *scordioides* leads us to follow the interpretation of Venanzoni & Gigante (2000) also for our communities.

Schoenus nigricans community (Table 3, relevé 13, Fig. 3u)

A stand dominated by *Schoenus nigricans* was detected within a wet depression, in a clearing of *Salix eleagnos* formation, in the floodplain of the Upper Tiber Valley. It could be considered an impoverished aspect of the association *Epipactido palustris-Schoenetum nigricantis* described by Biondi & Baldoni (1994) and recorded recently by Lastrucci *et al*. (2006). Despite the exiguity of the detected stand, the finding of *S. nigricans* along the Tiber is important because it shows the connection between floodplain wetlands and those present in the surrounding ultramafic reliefs where this species occurs more or less widely (Lastrucci *et al*., 2006).

Rorippo sylvestris-Agrostietum stoloniferae Oberdorfer et Müller in Müller 1961 (Table 3, relevés 14-15, Fig. 3i)

This association of low herbs grows on flooded gravel-sandy soil creating dense meadows in the Upper Tiber Valley where it makes contact on one part with emergent plant formations such as *Nasturtietum officinalis,* and on the other part with associations of the class *Bidentetea*. The contact of the association with the *Bidention* coenoses is underlined also by Carreras *et al*. (1988) for the eastern half of the Iberian Pyrenees.

Rorippa x *anceps* community (Table 3, relevés 16-17, Fig. 3k)

Vegetation dominated by *Rorippa* x *anceps* grows on prolonged flooded Chiascio riverbanks; *Rorippa* x *anceps* has a higher water requirement than *R. sylvestris* (Ellenberg 1988, Pignatti 2005) and the phytocoenosis differs from the *Rorippo sylvestris-Agrostietum stoloniferae* due the fewer number of *Molinio-Arrhenathereta* species and the presence of helophytic/hygrophytic elements (*Carex elata, Lysimachia vulgaris, Lythrum salicaria, Phragmites australis* or *Lycopus europaeus*) which testify the contact with the *Eupatorio-Caricetum*.

Cirsio triumfettii-Eupatorietum cannabini Brullo et Spampinato 1990 (Table 3, relevés 18-22, Fig. 3t)

Vegetation dominated by tall herbs such as *Eupatorium cannabinum, Cirsium creticum* subsp. *triumfettii* and *Pulicaria dysenterica* occurs along the riverbanks and islets in the floodplain of the Tiber and on the banks of the Stream Ventia, growing on the transition zone between the wet riverbed and the riparian shrubland or woodland. This vegetation could be referred to the association *Cirsio triumfettii-Eupatorietum cannabini* described by Brullo & Spampinato (1990) for rivers of North-Eastern Sicily, and later reported from Central Italy by Pirone (2000) and Lastrucci *et al*. (2010c).

RIPARIAN WILLOW SHRUBLAND AND DECIDUOUS WOODLAND OF THE CLASS *SALICI PURPUREAE-POPULETEA NIGRAE*

Salicetum incano-purpureae Sillinger 1933 subass. *typicum* (Table 4, relevés 1-8)

In the Upper Tiber Valley, along the riverbanks, the vegetation is characterized by the presence of dense shrubland dominated by *Salix purpurea* and *Salix eleagnos,* assignable to the association *Salicetum incano-purpureae*. This pioneer association is often located on islets or near the riverbanks, subject to periodic floodings. In the dense shrub layer there are, in addition to the *Salix species, Populus nigra, Cornus sanguinea* and *Ligustrum vulgare,* all well represented. The herbaceous flora is rather heterogeneous in phytosociological terms, including species of very different classes. The floristic composition of our relevés allows us to recognize the subass. *typicum* according to Oriolo & Poldini (2002) with some elements of both the hill and plain forms reported by Oriolo & Poldini (2002). In one site an impoverished variant with the invasive alien species *Amorpha fruticosa* was found (see Biondi *et al*., 1999; Oriolo & Poldini, 2002).

Alnus glutinosa community (Table 4, relevés 9-11)

In the downstream section of Montedoglio dam, woods of *Alnus glutinosa,* accompanied by *Populus nigra* and *Salix alba*, are rather common. They grow in an area more or less raised above the river, usually on the terraces or distant from the active riverbed where the waterlogging is sporadic. The floristic composition of this vegetation does not enable a certain syntaxonomic attribution, especially with reference to the recent considerations of Sburlino *et al*. (2012) about the *Alnion incanae* alliance. Awaiting a wider review of lowland riparian *Alnus glutinosa* vegetation, we refer our coenoses to the order *Populetalia*, following the riparian forest classification of Rivas-Martínez *et al*. (2001, 2002).

Table 4 - Vegetation of the class *Salici purpureae-Populetea nigrae*

Relevé number	1	2	3	4	5	6	7	8	9	10	11	
Locality	T	TS	T	T	T	TS	T	T	T	T	T	Presences
Surface (m²)	18	20	25	10	10	15	25	10	200	400	150	
Total cover (%)	95	100	100	100	100	100	100	90	100	95	100	
Charact. and diff. (d) of association or dominant species												
Salix eleagnos Scop.	5	4	5	5	5	5	4	+	.	.	.	8
Salix purpurea L.	.	.	1	2	2	+	3		+	.	.	6
Amorpha fruticosa L. (d)	.	.	.	.	.	.	.	4	.	.	.	1
Alnus glutinosa (L.) Gaertn.	.	.	.	.	.	.	.	.	5	5	5	3
Charact. and diff. of *Salici purpureae-Populetea nigrae*												
Populus nigra L.	.	2	1	2	2	1	1	.	1	1	2	9
Brachypodium sylvaticum (Huds.) P. Beauv.	3	.	3	2	2	.	3	.	5	3	4	8
Rubus caesius L. (d)	.	.	.	2	r	+	2	.	1	3	2	7
Carex pendula Huds.	.	.	.	.	.	.	.	.	1	2	2	3
Humulus lupulus L.	+	.	.	.	.	.	.	.	1	.	1	3
Carex remota L.	+	.	.	.	.	.	.	.	.	+	.	2
Salix alba L.	.	.	.	.	.	.	.	.	1	1	.	2
Aristolochia rotunda L.	.	.	.	.	.	.	.	.	.	.	+	1
Elymus caninus (L.) L.	+	.	.	.	.	.	.	.	.	.	.	1
Schedonorus giganteus (L.) Holub	.	.	.	.	.	.	.	.	.	+	.	1
Solanum dulcamara L.	.	.	.	.	.	.	.	.	.	.	+	1
Ulmus minor Miller	.	.	.	.	.	.	.	.	.	.	+	1
Other species												
Clematis vitalba L.	+	+	2	2	1	+	1	.	+	.	1	9
Cornus sanguinea L. s.l.	1	+	1	2	+	.	2	.	2	3	3	9
Galium album Mill.	+	.	1	1	+	+	+	.	+	+	+	9
Tommasinia verticillaris (L.) Bertol.	1	+	.	r	+	+	2	.	+	+	+	9
Pastinaca sativa L.	+	+	1	+	+	+	1	.	.	+	.	8
Ligustrum vulgare L.	+	.	.	1	r	.	+	.	2	2	3	7
Eupatorium cannabinum L.	.	.	1	.	.	+	+	.	1	+	+	6
Hedera helix L.	1	.	.	2	.	.	+	.	1	3	2	6
Rubus ulmifolius Schott	1	.	+	+	.	.	+	.	2	.	1	6
Acer campestre L.	.	.	.	.	.	.	+	.	+	+	+	4
Dioscorea communis (L.) Caddick & Wilkin	.	.	+	+	.	.	.	.	+	+	.	4
Emerus major	.	+	+	.	.	.	+	.	.	.	+	4
Euphorbia amygdaloides L.	.	+	.	.	.	.	+	.	+	.	+	4
Viola alba Besser subsp. dehnhardtii (Ten.) W. Becker	.	.	.	.	.	.	1	.	1	+	+	4
Artemisia vulgaris L.	.	+	.	.	.	+	+	.	.	.	.	3
Carex flacca Schreb.	.	.	.	.	+	.	.	.	+	+	.	3
Centaurea nigrescens Willd. subsp. pinnatifida (Fiori) Dostál	.	.	.	.	1	+	+	.	.	.	.	3
Daucus carota L. s.l.	.	+	r	.	+	.	.	.	.	.	.	3
Equisetum arvense L.	.	+	.	.	.	.	.	.	+	1	.	3
Fraxinus ornus L.	.	.	.	.	.	.	.	.	+	+	+	3
Helleborus foetidus L.	.	+	.	.	.	.	.	.	+	.	+	3
Lycopus europaeus L.	.	.	.	.	.	+	.	+	1	.	.	3
Mentha aquatica L.	.	.	.	.	.	+	.	1	+	.	.	3
Potentilla reptans L.	.	.	.	.	.	+	r	+	.	.	.	3
Rosa canina L.	.	+	r	.	r	.	.	.	.	.	.	3
Petasites hybridus (L.) P. Gaertn., B. Mey. et Scherb.	.	.	.	.	.	.	2	.	+	+	.	3
Agrostis stolonifera L.	.	.	.	.	.	2	.	+	.	.	.	2
Anthyllis vulneraria L.	.	.	.	+	.	.	+	.	.	.	.	2
Bromopsis erecta (Huds.) Fourr.	.	.	.	.	1	.	1	.	.	.	.	2
Convolvulus arvensis L.	.	.	.	.	.	+	r	.	.	.	.	2
Corylus avellana L.	.	+	.	.	.	.	.	.	.	.	+	2
Dactylis glomerata L.	.	.	.	.	r	.	+	.	.	.	.	2
Geranium rotundifolium L.	.	.	.	r	+	.	.	.	.	.	.	2
Hypericum perforatum L.	.	+	.	.	.	.	r	.	.	.	.	2
Knautia arvensis (L.) Coult.	.	.	.	.	+	.	+	.	.	.	.	2
Lonicera sp.	.	.	.	.	.	.	.	.	.	+	+	2
Lotus hirsutus L.	.	.	.	.	+	.	+	.	.	.	.	2
Melilotus albus Medik.	.	+	.	.	.	+	.	.	.	.	.	2
Quercus pubescens Willd.	.	.	.	.	r	.	.	.	.	.	+	2
Robinia pseudoacacia L.	.	+	.	.	.	.	.	.	+	.	.	2
Sambucus nigra L.	1	.	.	.	.	.	.	.	+	.	.	2
Sanguisorba minor Scop.	.	.	.	.	+	.	+	.	.	.	.	2
Spartium junceum L.	.	.	.	.	+	.	1	.	.	.	.	2
Tussilago farfara L.	.	1	.	.	.	+	.	.	.	.	.	2
Sporadic species	0	4	0	3	8	2	6	3	7	5	3	

Conservation aspects

This work points out the occurrence of Habitats of the European Directive 92/43/EEC (Biondi *et al.*, 2009; Biondi *et al.*, 2012) reported in Table 5. Besides these we also highlighted the occurrence of a Habitat of Regional Interest in accordance with the Regional Law of Tuscany LR 56/2000. The number of Habitats found, together with various floristic emergencies recorded (e.g. *Typha minima, Juncus subnodulosus, Potamogeton schweinfurthii, Epipactis palustris, Carex elata, Isolepis cernua, Najas marina*) confirms the high naturalistic value of wetlands and their importance for biodiversity conservation.

Code Natura 2000	Alliance references
3130	*Nanocyperion*
3140	*Charion globularis*
3150	*Lemnion minoris, Hydrocharition morsus-ranae, Potamion*
3240	*Salicion incanae*
3270	*Bidention tripartitae, Chenopodion rubri*
6420	*Molinio-Holoschoenion*
6430	*Aegopodion podagrariae*
Habitat of regional interest in Tuscany (L.R. 56/2000)	*Glycerio-Sparganion* with references to Cod. Corine Biotopes 53,4

Tab. 5 - Habitat of Conservation Interest found in the study area

Syntaxonomic scheme

Charetea fragilis Fukarek ex Krausch 1964
Charetalia hispidae Sauer ex Krausch 1964
Charion globularis Krausch 1964
Charetum vulgaris Corillion 1957

Lemnetea Tüxen ex O. Bolós et Masclans 1955
Lemnetalia minoris Tüxen ex O. Bolós et Masclans 1955
Lemnion minoris O. Bolós et Masclans 1955
Lemna minor community
Hydrocharition morsus-ranae (Passarge 1964) Westhoff et den Held 1969
Ceratophylletum demersi Corillion 1957

Potametea Klika in Klika et V. Novák 1941
Potametalia Koch 1926
Potamion Miljan 1933
Potametum denso-nodosi de Bolós 1957
Najadetum marinae Fukarek 1961
Potametum schweinfurthii ass. nova *hoc loco*
potametosum schweinfurthii subass. nova *hoc loco*
najadetosum marinae subass. nova *hoc loco*
Potametum pectinati Carstensen ex Hilbig 1971
Potamo pectinati-Myriophylletum spicati Rivas Goday 1964 corr. Conesa 1990
Potametum pusilli Soó 1927
Potamogeton crispus community

Bidentetea tripartitae Tüxen, Lohmeyer et Preising ex von Rochow 1951
Bidentetalia tripartitae Br.-Bl. et Tüxen ex Klika et Hadač 1944
Bidention tripartitae Nordhagen ex Klika et Hadač 1944
Polygonetum hydropiperis Passarge 1965
Chenopodion rubri (Tüxen 1960) Hilbig et Jage 1972
Polygono lapathifolii-Xanthietum italici Pirola et Rossetti 1974
Cyperetum esculenti Wisskirchen 1995

Isoëto-Nanojuncetea Br.-Bl. et Tüxen ex Tüxen ex Br.-Bl. *et al*. 1952
Nanocyperetalia Klika 1935
Nanocyperion Koch ex Libbert 1932
Cyperus fuscus community
Isolepis cernua community

Phragmito-Magnocaricetea Klika in Klika et V. Novák 1941
Phragmitetalia Koch 1926
Phragmition australis Koch 1926
Phragmitetum australis Savič 1926
Phragmito-Typhetum minimae Trinajstic 1964
Typhetum latifoliae Nowiński 1930
Oenanthetalia aquaticae Hejný ex Balátová-Tuláčková, Mucina, Ellmauer et Wallnöfer in Grabherr et Mucina 1993
Eleocharito palustris-Sagittarion sagittifoliae Passarge 1964
Eleocharitetum palustris Savič 1926
Schoenoplectus pungens community
Nasturtio-Glycerietalia Pignatti 1953
Glycerio-Sparganion Br.-Bl. et Sissingh in Boer 1942
Sparganietum erecti Roll 1938
Leersietum oryzoidis Eggler 1933
Nasturtietum officinalis Gilli 1971
Phalaridion arundinaceae Kopecký 1961
Rorippo-Phalaridetum arundinaceae Kopecký 1961
Magnocaricetalia Pignatti 1953
Magnocaricion elatae Koch 1926
Galio palustris-Juncetum inflexi Venanzoni et Gigante 2000
Cyperetum longi Mievski 1957
Eupatorio cannabini-Caricetum elatae Biurrun, J.A. Molina et Loidi in Biurrun 1999

Galio-Urticetea Passarge ex Kopecký 1969
Galio aparines-Alliarietalia petiolatae Görs et Müller 1969
Aegopodion podagrariae Tüxen 1967
Phalarido-Petasitetum hybridi Schwick. 1933
Convolvuletalia sepium Tüxen ex Mucina 1993
Convolvulion sepium Tüxen ex Oberdorfer 1957
Calystegio-Asteretum lanceolati (Holzner *et al*. 1978) Passarge 1993

Festuco-Brometea Br.-Bl. et Tüxen ex Soó 1947
Brometalia erecti Koch 1926
Bromion erecti Koch 1926
Peucedano verticillaris-Ononidetum natricis Biondi et Baldoni 1994

Molinio-Arrhenatheretea Tüxen 1937
Holoschoenetalia vulgaris Br.-Bl. ex Tchou 1948
Molinio-Holoschoenion vulgaris Br.-Bl. ex Tchou 1948
Holoschoenetum vulgaris Br.-Bl. ex Tchou 1948
Juncus subnodulosus community
Schoenus nigricans community
Plantaginetalia majoris Tüxen et Preising in Tüxen 1950
Agrostion stoloniferae Görs 1966
Rorippo sylvestris-Agrostietum stoloniferae Oberdorfer et Müller in Müller 1961
Rorippa x *anceps* community
Mentho-Juncion inflexi De Foucault 1984
Cirsio triumfettii-Eupatorietum cannabini Brullo et Spampinato 1990

Salici purpureae-Populetea nigrae (Rivas-Martínez & Cantó ex Rivas-Martínez, Báscones, T.E. Díaz, Fernández-González et Loidi 1991) Rivas-Martínez, T.E.Díaz, Fernández-Gonzalez, Izco, Loidi, Lousã et Penas 2002
Salicetalia purpureae Moor 1958
Salicion incanae Aichinger 1933
Salicetum incano-purpureae Sillinger 1933 subass. *typicum*
Populetalia albae Br.-Bl. ex Tchou 1948
Alnus glutinosa community

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Appendix 1: Sporadic species

Table 1:

Rel. 1: *Juncus articulatus* L. (+); Rel. 4: *Persicaria hydropiper* (L.) Delarbre (1), *Echinochloa crus-galli* (L.) P. Beauv. (+); Rel. 8: *Agrostis stolonifera* L. (+); Rel. 27: *Persicaria lapathifolia* (L.) Delarbre (+).

Table 2:

Rel. 7: *Petasites hybridus* (L.) G. Gaertn., B. Mey. et Scherb. (+), *Trifolium nigrescens* Viv. (+), *Amorpha fruticosa* L. (+); Rel. 8: *Lolium rigidum* Gaudin (3), *Centaurea jacea* L. subsp. *gaudinii* (Boiss. et Reut.) Gremli (+), *Dysphania ambrosioides* (L.) Mosyakin et Clemants (+); Rel. 13: *Son-*

chus asper (L.) Hill (+); Rel. 16: *Brachypodium sylvaticum* (Huds.) P. Beauv. (+); Rel. 17: *Lysimachia nummularia* L. (+); *Equisetum ramosissimum* Desf. (+); Rel. 22: *Daucus carota* L. (1), *Picris hieracioides* L. (+), *Schedonorus arundinaceus* (Schreb.) Dumort. (+), *Euphorbia platyphyllos* L. (+); Rel. 23: *Prunella vulgaris* L. (+), *Carex flacca* Schreb. (+); Rel. 24: *Rumex conglomeratus* Murray (+); Rel. 35: *Stuckenia pectinata* (L.) Börner (+); Rel. 43: *Rumex crispus* L. (+), *Setaria sp.* (+); Rel. 44: *Salix triandra* L. (1); Rel. 46: *Tommasinia verticillaris* (L.) Bertol. (1), *Scrophularia auriculata* L. (+); Rel. 47: *Solanum dulcamara* L. (+); Rel. 49: *Brachypodium rupestre* (Host) Roem. et Schult. (+).

Table 3:
Rel.1: *Solanum dulcamara* L. (1), *Clinopodium vulgare* L. (+); Rel. 2: *Populus alba* L. (+); Rel. 3: *Equisetum telmateia* Ehrh. (2), *Arum italicum* Mill. (+); Rel. 4: *Leersia oryzoides* (L.) Sw. (3), *Cyperus fuscus* L. (+), *Helosciadium nodiflorum* (L.) W.D.J. Koch (+); Rel. 6: *Emerus major* Mill. (2), *Cichorium intybus* L. (+), *Crepis foetida* L. (+), *Artemisia vulgaris* L. (r), *Inula conyzae* (Griess.) DC. (r), *Robinia pseudoacacia* L. (r), *Sonchus asper* (L.) Hill (r), *Sorbus domestica* L. (r), *Taraxacum officinale* Weber ex F.H. Wigg. agg. (r). Rel. 7: *Helleborus foetidus* L. (+), *Petrorhagia saxifraga* (L.) Link (+), *Picris hieracioides* L. (+), *Elytrigia repens* (L.) Nevski (r), *Hedera helix* L. (+); Rel. 8: *Scrophularia canina* L. (3), *Lactuca saligna* L. (+); Rel. 12: *Alisma lanceolatum* With. (+); Rel. 13: *Alnus cordata* (Loisel.) Duby (+); Rel. 14: *Nasturtium officinale* W.T. Aiton (1), *Veronica beccabunga* L. (1), *Epilobium hirsutum* L. (+), *Melilotus albus* Medik. (+), *Persicaria dubia* (Stein) Fourr. (+), *Polypogon monspeliensis* (L.) Desf. (+), *Echinochloa crus-galli* (L.) P. Beauv. (r); Rel. 15: *Rorippa amphibia* (L.) Besser (+); Rel. 19: *Juniperus communis* L. (+); Rel. 21: *Primula vulgaris* Huds. (+); Rel. 22: *Ulmus minor* Mill. (1).

Table 4:
Rel. 2: *Acer opalus* Mill. subsp. *obtusatum* (Waldst. et Kit. ex Willd.) Gams (+), *Geranium columbinum* L. (+), *Medicago lupulina* L. (+), *Vicia cracca* L. (+); Rel. 4. *Galium aparine* L. (+), *Lathyrus sylvestris* L. (+), *Ranunculus lanuginosus* L. (+); Rel. 5: *Ononis natrix* L. (1), *Centaurea jacea* L. subsp. *gaudinii* (Boiss. et Reut.) Gremli (+), *Helminthotheca echioides* (L.) Holub (+), *Plantago lanceolata* L. (+), *Plantago sempervirens* Crantz (+), *Echium vulgare* L. (r), *Pulicaria dysenterica* (L.) Bernh. (r), *Scabiosa columbaria* L. (r). Rel. 6: *Calystegia sepium* (L.) R. Br. (+), *Mentha spicata* L. (+). Rel. 7: *Cirsium vulgare* (Savi) Ten., *Cota tinctoria* (L.) J. Gay (+), *Digitalis lutea* L. subsp. *australis* (Ten.) Arcang. (+), *Dittrichia viscosa* (L.) Greuter (+), *Polygala flavescens* DC. (+), *Achillea millefolium* L. (r). Rel. 8: *Lysimachia nummularia* L. (2), *Galium palustre* L. (+), *Phragmites australis* (Cav.) Steud. (+). Rel. 9: *Juniperus communis* L. (1), *Arctium sp.* (+), *Bidens frondosus* L. (+), *Clinopodium vulgare* L. (+), *Crataegus monogyna* Jacq. (+), *Primula vulgaris* Huds. (+), *Quercus cerris* L. (+); Rel. 10: *Vitis sp.* (1), *Equisetum palustre* L. (+), *Jacobaea erratica* (Bertol.) Fourr. (+), *Juglans regia* L. (+), *Viola reichenbachiana* Jord. ex Boreau (+). Rel. 11: *Campanula trachelium* L. (+), *Cruciata glabra* (L.) Ehrend. (+), *Prunus spinosa* L. (+).

Appendix 2: relevés dates

Table 1:
Rel. 1 22/7/08, Rel. 2 05/08/08, Rel. 3 12/9/08, Rel. 4 12/09/08, Rel. 5 12/09/08, Rel. 6 08/7/06, Rel. 7 31/7/08, Rel. 8 22/7/08, Rel. 9 05/08/08, Rel. 10 12/9/08, Rel. 11 12/9/08, Rel. 12 22/7/08, Rel. 13 31/7/09, Rel. 14 31/7/09, Rel. 15 23/8/06, Rel. 16 22/7/08, Rel. 17 22/7/08, Rel. 18 31/7/09, Rel. 19 31/7/09, Rel. 20 12/08/08, Rel. 21 27/08/08, Rel. 22 23/8/06, Rel. 23 27/08/08, Rel. 24 12/08/08, Rel. 25 23/8/06, Rel. 26 05/08/08, Rel. 27 05/08/08, Rel. 28 12/9/08, Rel. 29 12/9/08, Rel. 30 12/9/08, Rel. 31 12/08/08, Rel. 32 05/08/08, Rel. 33 12/08/08, Rel. 34 12/08/08, Rel. 35 12/08/08, Rel. 36 12/08/08, Rel. 37 12/9/08, Rel. 38 31/7/08, Rel. 39 05/08/08.

Table 2:
Rel. 1 12/9/08, Rel. 2 12/9/08, Rel. 3 12/9/08, Rel. 4 05/08/08, Rel. 5 05/08/08, Rel. 6 31/7/08, Rel. 7 05/08/08, Rel. 8 05/08/08, Rel. 9 23/8/06, Rel. 10 27/08/08, Rel. 11 31/7/08, Rel. 12 31/7/08, Rel. 13 05/08/08, Rel. 14 31/7/08, Rel. 15 31/7/08, Rel. 16 08/7/06, Rel. 17 23/8/06, Rel. 18 27/08/08, Rel. 19 27/08/08, Rel. 20 08/7/06, Rel. 21 04/07/09, Rel. 22 22/7/08, Rel. 23 08/7/06, Rel. 24 27/08/08, Rel. 25 23/8/06, Rel. 26 31/7/09, Rel. 27 31/7/09, Rel. 28 31/7/09, Rel. 29 31/7/09, Rel. 30 31/7/09, Rel. 31 08/7/06, Rel. 32 22/7/08, Rel. 33 27/08/08, Rel. 34 08/7/06, Rel. 35 12/9/08, Rel. 36 22/7/08, Rel. 37 05/08/08, Rel. 38 05/08/08, Rel. 39 08/7/06, Rel. 40 31/7/08, Rel. 41 17/7/08, Rel. 42 17/7/08, Rel. 43 05/08/08, Rel. 44 08/7/06, Rel. 45 05/08/08, Rel. 46 31/7/08, Rel. 47 31/7/08, Rel. 48 31/7/08, Rel. 49 31/7/08, Rel. 50 31/7/08.

Table 3:
Rel. 2 2/7/08, Rel. 2 17/7/08, Rel. 3 31/7/08, Rel. 4 12/9/08, Rel. 5 12/9/08, Rel. 6 08/7/06, Rel. 7 08/7/06, Rel. 8 08/7/06, Rel. 9 22/7/08, Rel. 10 22/7/08, Rel. 11 05/08/08, Rel. 12 05/08/08, Rel. 13 08/7/06, Rel. 14 17/7/08, Rel. 15 17/7/08, Rel. 16 31/7/08, Rel. 17 31/7/08, Rel. 18 08/7/06, Rel. 19 27/08/08, Rel. 20 22/7/08, Rel. 21 05/08/08, Rel. 22 05/08/08.

Table 4:
Rel. 1 03/6/06, Rel. 2 17/7/08, Rel. 3 08/7/06. Rel. 4 08/7/06, Rel. 5 08/7/06, Rel. 6 17/7/08, Rel. 7 08/7/06, Rel. 8 08/7/06, Rel. 9 22/7/08, Rel. 10 22/7/08, Rel. 11 31/7/08.

Table 2 - Vegetation of the classes *Bidentetea tripartitae*, *Isoëto-Nanojuncetea* and *Phragmito-Magnocaricetea*

Relevé. 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	41	42	43	44	45	46	47	48	49	50	Presences
Number in the cluster (Fig. 3)	1	2	3	7	8	4	6	5	9	14	11	12	13	10	15	16	17	19	18	20	23	22	21	24	25	31	32	33	26	29	30	27	28	34	36	35	37	38	40	43	41	42	39	44	45	46	47	49	48	50	
Locality	TM	TM	TM	TP	TP	C	TP	TP	T	TL	C	C	TP	C	T	T	TL	TL	TL	T	TL	T	T	TL	T	TL	TL	T	TL	TL	TL	TL	T	TM	T	TP	TP	T	C	TS	TS	TP	TL	TP	C	C	C	C	C	
Surface (m²)	8	20	8	4	4	6	8	16	1	8	9	1	1	1	1	10	10	10	16	6	8	4	4	50	10	6	4	4	8	1	2	4	2	4	20	10	2	5	2	4	2	2	4	5	4	16	16	16	16	8	
Total cover (%)	100	100	100	85	80	70	100	100	85	90	100	90	100	90	85	100	90	100	100	100	100	80	80	90	95	90	80	95	60	50	50	80	40	80	100	100	100	100	100	100	100	100	100	70	90	100	100	100	100	100	
Bidens frondosus L.	4	3	3	1	+	1	+	2	+	+	+	1	1	2	.	.	.	+	+	.	.	.	.	1	+	.	.	.	.	.	.	.	.	1	1	.	+	+	.	.	+	.	1	+	1	+	+	+	+	+	31
Persicaria hydropiper (L.) Delarbre	3	4	4	.	.	.	1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Cyperus esculentus L.	.	1	2	4	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Xanthium orientale L. subsp. italicum (Moretti) Greut	.	+	+	+	+	3	5	5	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	1	.	.	+	.	+	12
Persicaria lapathifolia (L.) Delarbre	.	1	.	.	.	1	2	2	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	8
Cyperus fuscus L.	.	1	.	1	+	.	.	.	4	5	5	5	5	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9
Isolepis cernua (Vahl) Roem. et Schult.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Phragmites australis (Cav.) Steud.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	5	5	5	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	7
Typha minima Funk	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	5	4	4	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Typha latifolia L.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	1	.	.	5	5	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7
Eleocharis palustris (L.) Roem. et Schult.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	4	5	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Schoenoplectus pungens (Vahl) Palla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	2	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Sparganium erectum L.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	5	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Leersia oryzoides (L.) Sw.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Nasturtium officinale W.T. Aiton	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	5	5	5	.	.	.	.	.	.	.	.	4
Phalaroides arundinacea (L.) Rauschert	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	2
Juncus inflexus L.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	3
Galium palustre L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	3
Cyperus longus L.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	+	.	5	.	.	.	.	.	.	4
Carex elata All.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	5	5	5	5	5	6
Eupatorium cannabinum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	2	1	1	+	.	7
Charact. *Bidentetea tripartitae*																																																		
Echinochloa crus-galli (L.) P. Beauv.	2	+	+	.	1	3	+	1	.	.	2	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	11
Bidens connatus Muhl. ex Willd.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Charact. *Isoëto-Nanojuncetea*																																																		
Juncus bufonius L.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Centaurium pulchellum (Sw.) Druce	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Mentha pulegium L.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Blackstonia perfoliata (L.) Huds.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Charact. *Phragmito-Magnocaricetea*																																																		
Lythrum salicaria L.	.	2	+	1	+	.	1	+	.	.	.	+	+	.	1	.	.	.	.	.	.	2	1	.	1	.	.	.	.	.	.	.	.	+	.	3	1	.	.	.	.	1	.	2	1	1	1	+	1	22
Mentha aquatica L.	.	.	.	.	.	.	.	.	2	1	.	.	1	.	2	.	.	2	.	2	.	1	2	+	2	.	3	3	+	+	+	.	2	.	.	1	.	.	+	.	+	+	.	.	.	.	+	.	.	.	21
Lycopus europaeus L.	.	1	1	1	+	.	1	.	+	2	.	.	.	+	.	+	.	1	.	+	.	.	1	3	1	1	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	1	.	.	18
Lysimachia vulgaris L.	.	.	.	+	+	.	.	.	.	.	.	2	.	+	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2	2	+	2	7
Veronica anagallis-aquatica L.	.	.	.	.	.	.	.	.	.	.	2	.	+	+	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	1	.	.	.	.	.	.	.	.	7
Alisma plantago-aquatica L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	+	.	.	.	.	.	.	.	2	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	6
Veronica beccabunga L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	3
Alisma lanceolatum With.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Helosciadium nodiflorum (L.) W.D.J. Koch	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Rorippa amphibia (L.) Besser	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
Schoenoplectus tabernaemontani (C. C. Gmel.) Palla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Other species																																																		
Juncus articulatus L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	2	.	.	.	.	.	.	.	1	+	.	+	.	1	3	2	2	2	1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	13
Calystegia sepium (L.) R. Br.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	+	.	.	2	2	1	.	1	10
Equisetum arvense L.	.	.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	+	+	.	.	.	.	.	.	2	.	+	.	+	.	10
Agrostis stolonifera L.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	1	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	1	.	3	.	.	.	.	.	9
Paspalum distichum L.	.	2	1	1	+	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	3	3	.	.	.	.	3	.	.	.	.	.	.	.	.	9
Salix purpurea L.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	1	.	1	.	.	1	.	1	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8
Epilobium hirsutum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	+	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Equisetum palustre L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	2	2	+	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Plantago major L.	.	.	.	.	.	.	.	.	1	.	+	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	5
Pulicaria dysenterica (L.) Bernh.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	5
Rubus caesius L.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	2	5
Artemisia vulgaris L.	.	.	.	.	.	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	4
Populus nigra L.	.	2	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	4
Salix alba L.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	4
Jacobaea erratica (Bertol.) Fourr.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Stachys palustris L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	3
Verbena officinalis L.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	3
Carex pendula Huds.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Chara sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Epilobium tetragonum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Epipactis palustris (Mill.) Crantz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Equisetum telmateia Ehrh.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	.	.	2
Erigeron sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2
Potamogeton nodosus Poir.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	2
Potamogeton schweinfurthii A. Benn.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Potentilla reptans L.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Ranunculus repens L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	2
Rorippa sylvestris (L.) Besser	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2
Rorippa x anceps (Wahlenb.) Rchb.	.	.	.	.	.	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Scirpoides holoschoenus (L.) Soják	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Symphyotrichum lanceolatum (Willd.) G.L. Nesom	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	2
Tussilago farfara L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	2
Urtica dioica L.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Sporadic species	0	0	0	0	0	0	3	3	0	0	0	0	1	0	0	1	2	0	0	0	0	4	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	0	2	1	0	1	0	