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THE PLANT ASSOCIATION *EPILOBIO-JUNCETUM EFFUSI* IN THE NOTEĆ RIVER VALLEY (WIELKOPOLSKA)

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ABSTRACT. Floristic lists and community inventories with soft rush (*Juncus effusus*) were prepared during the vegetative seasons of 2004-2006 in the Noteć Bystra River valley in four villages situated in Czarnków–Trzcianka district. Phytosociological surveys were classified to the phytosociological system in accordance with Matuszkiewicz's (2006) works. The examined community occurs on compacted soils, excessively moist and almost completely deprived of air with poorly permeable layer of gyttia and peat found at the depth of 40 to 90 cm. It is a multi-species community. The community develops both on organic and mineral-organic soils and it is considered to be of poor value, secondary and anthropogenic.

KEY WORDS: *Juncus effusus* communities, meadow, pasture, the Noteć River valley

INTRODUCTION

The association of soft rush *Epilobio-Juncetum effusi* was described already in 1957 by Oberdorf (1957). Until recently, it was found fairly frequently as described by Jasnowski (1962), Kucharski and Michalska-Hejduk (1994), as well as Brzeg and Wojterska (2001). Presently, it occurs relatively less frequently, although we can find it is abundant on some pastures in patches where agronomy is poor and where it tends to dominate the sward. Matuszkiewicz (2006) considered the soft rush association as fairly common in Poland and blamed heavy pasturing of moist low moor peat, as well as wet meadows situated on humic-loam substrate as the main cause of its development. On the other hand, Honczarenko (1963) believes that the observed increased proportions of the soft rush in sward can be attributed to inappropriate soil physical properties: decreased porosity and increased soil moisture content. According to Denisiuk and Grynia (1965), the community develops both on organic and mineral-organic soils and it is considered to be of poor value, secondary and anthropogenic. The growth and excessive development of soft rush can be attributed to such mistakes made by man as: grazing of excessively wet meadows and pastures, rolling and the use of heavy tractors frequently pulling loaded trailers or other additional farming equipment. Generally speaking, the community is considered economically worthless and *Juncus effusus* is one of the most dangerous weeds of low fodder value depriving the soil of its nutrients. It is a multi-species community and, from the physiological point of view, it reminds most a community with tufted hairgrass.

The community is dominated by a characteristic species of *Juncus effusus* while such distinctive species as: *Epilobium palustre* and *Juncus articulatus* occur less frequently. Among loosely distributed tussocks, numerous species of grass, herbs and weeds of wet meadows from *Molinio-Arrhenatheretea* and *Phragmitetea* classes can be found. In the case of very intensive utilisation, the soil is deprived of plants, bare and covered by sticky, greasy peat. Rich, dense tufts of *Juncus effusus* grow and develop well on excessively moist areas with stagnating water. In such soils, top organic layers are shallow and are depositied on alluvial sands with a poorly permeable layer of gyttia and peat usually situated at the depth of 40 to 90 cm. Soils are compacted, excessively wet and nearly completely without air. They are situated in waterlogged land depressions, coastal areas of ponds as well as degraded peat bogs. The anatomic structure of soft rushes which have a special tissue called earenchyma as well as numerous, large intrecellular spaces in the forms of canals makes it possible to supply air to the underground organs. This ensures possibilities of growth and development in such difficult environment as well as high competitiveness in relation to other species, especially grasses.

The aim of the performed investigations was to conduct current evaluation of the floristic composition, economic importance and phytosociological analysis of the soft rush association *Epilobio-Juncetum effusi* in five villages situated in the Noteć River valley and to assess

the influence of site conditions on the dynamics and structure of this association.

DESCRIPTION OF THE RESEARCH SITE

The described investigations were carried out on grasslands situated in the following five villages: Mirosław, Radolin, Nowe Dwory, Folsztyn and Lubcz Mały extending along the so called Noteć Bystra valley in Czarnków–Trzcianka district of Wielkopolska Voivodeship. Large areas of wet meadows and pastures are cut across by a dense network of ditches and drainage cannals as well as natural water courses and old river beds. At the present time, numerous herds of cattle raised by individual farmers can graze here and the large complex of permanent grassland growing in natural conditions constitutes a rich forage base. From the point of view of geomorphology, these areas are located within the first terrace of the Noteć River ice-marginal valley (the distance of test points from the river – from 1.5 to 2.8 km).

MATERIAL AND METHODS

The described floristic investigations of communities with soft rush *Juncus effusi* were carried out on: meadows cut twice annually and where hay is harvested according to the traditional, commonly applied method (cutting with a rotary mower, shaken, raked and baled), farm pastures and on a long-term wasteland. On the basis of detailed field studies carried out during vegetatives seasons of 2004-2006, phytosociological releves well as community inventories were prepared. From among the total of 44 phytosociological surveys taken with the assistance of the Dierschke (1994) method, this study utilised 24 releves documenting the examined association. Species membership to syntaxonomic units as well as communites depiction was adopted after Brzeg and Wojterska (2001), while the nomenclature of vascular plants – after Mirek et al. (2002).

Site investigations involved making soil profiles in points characterised by a strong domination of the discussed plant community and they also represented different types of arable land: meadow (profile 1), pasture (profile 2) and wasteland (profile 3). Soil morphology and taxonomy was described in accordance with the Polish Soils Systematics. Soil samples of disturbed and intact structure were collected from individual soil genetic horizons. The following properties were determined: texture of mineral formations and solid phase density.

RESULTS AND DISCUSSION

The *Epilobio-Juncetum effusi* association is a multi-species, multi-layer community with soft rush as the dominant plat and numerous species of grasses, herbs and weeds in the floral layer (Table 1).

Soft rush is undoubtedly dominant in the vertical structure with a strongly tussock-type match, dominating over the majority of the remaining species. Its proportion in the sward is high and ranges from 60 to 90%. Depending on soil moisture conditions and land utilization, the number of plant species in the sward varies as shown in Table 1.

Floristic characterisation of the studied association

Meadow. The plant vegetation cover in the analysed patches ranged from 90 to 100% and the number of recorded plant species per one survey ranged from 16 to 27. The total number of identified plant species was high and reached 78 which confirms considerable floristic diversity of these meadows. The greatest numbers of species were allocated to the *Molinio-Arrhenatheretea* class, *Molinietalia* order and *Calthion* alliance. *Juncus effusus* was the dominant and, at the same time and it was found to occur in all nine examined patches of the 5th degree of constancy cover coefficient (6500). Apart from the soft rush, the following species were also characterised by high stability and coverage coefficients: *Festuca rubra*, *Deschampsia caespitosa*, *Filipendula ulmaria*, *Holcus lanatus*, *Alopecurus pratensis* as well as *Ranunculus repens* and *Poa pratensis*. They occupy higher sward layers characterised by the best lighting conditions. *Lotus uliginosus*, *Geum rivale*, *Poa trivialis* and *Vicia cracca* were found to occur in lower sward layers.

Pasture. Representative patches of 50 to 150 m^2 area showed soil coverage of 80 to 95%, with two patches covered in 100%. The number of species per one survey varied. The highest number of species – 31 was recorded on survey No. 19 taken on a pasture in Radolin and in the remaining surveys, it ranged from 14 to 22 (Table 1). Similarly to the analysed patches on the meadow, also in the case of the examined pasture, *Juncus effusus* was found to be the dominant and characteristic species for the association. It grows in patches of different sizes and free spaces are overgrown by vegetation, mainly herbs and weeds. Other plants which showed high phytosociological stability and coverage coefficients included: *Ranunculus acris*, *Geum rivale*, *Deschampsia caespitosa*, *Festuca rubra* and *Holcus lanatus*. *Alopecurus pratensis* and *Filipendula ulmaria* occurred in relatively small quantities.

Wasteland. During spring and heavy rainfalls, some surfaces are regularly flooded and that is where old, dense and impressive tufts of *Juncus effusus* gain of the 5th degree of stability and very high coverage coefficient (Table 1). This area is neither cut nor grazed due to excessive wetness. The vegetation coverage in all patches amounted to 100% and the quantity of identified species ranged from 21 to 23. Other species with high coverage coefficients included: *Deschampsia caespitosa*, *Filipendula ulmaria* as well as *Ranunculus repens*, *Cirsium palustre*, *Alopecurus pratensis* and *Lythrum salicaria*. *Holcus lanatus* demonstrated a high coverage coefficient but it occurred only in two patches and in the case of survey No. 35 its quantity equalled 3.

The discussed association of the soft rush *Epilobio-Juncetum effusi* is a secondary, anthropogenic community (Kucharski and Michalska-Hejduk 1994) found on meadows and pastures (Jasnowski 1962, Denisiuk and Grynia 1965, Grzelak 2004), frequently in the Noteć River valley. With regard to its economic significance,

Table 1. Differentiation of the floristic composition of *Epilobio-Juncetum effusi*

Successive number	1	2	3	4	5	6	7	8	9	10	Constancy	Cover coefficient	11	12	13	14	15	16	17	18	19	20	Constancy	Cover coefficient	19	20	21	22	Frequency	Cover coefficient
Number of record	1	2	5	6	8	9	10	11	13	14			15	16	17	19	21	23	24	29	33	34			35	38	39	40		
Area of record (m²)	100	100	200	200	80	100	50	100	100	90			50	100	100	50	150	100	100	100	50	80			30	50	30	25		
Cover of herb layer (%)	90	100	95	90	100	100	90	100	100	100			90	90	100	90	80	85	100	95	90	90			100	100	100	100		
Number of species in record	27	18	21	19	17	20	19	20	16	23			22	16	14	31	16	14	19	23	19	19			22	23	22	21		
*Locality	M	M	N	F	F	R	R	F	L	L			N	N	M	M	F	R	R	F	L	L			F	F	R	R		
Type of grassland	Meadow												Pasture												Wasteland					
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
ChAss. *Epilobio-Juncetum effusi*																														
Juncus effusus	4	4	5	4	4	4	4	4	3	5	V	6 500	4	3	4	3	4	5	3	4	4	3	V	5 694	5	4	4	5	4	7 500
Epilobium palustre	+	1	.	1	.	+	+	+	.	1	III	171	.	+	+	1	.	.	r	+	.	1	III	73	.	+	.	+	2	25
Juncus articulatus	.	.	+	.	+	.	.	.	.	.	II	11	+	.	.	.	.	.	.	.	+	.	I	11	.	.	.	.	.	.
ChAll. *Calthion*																														
Geum rivale	2	.	+	.	1	+	r	2	.	.	III	457	1	2	.	2	+	1	+	1	2	1	V	735	1	+	+	.	3	150
Caltha palustris	+	.	.	.	.	+	+	.	.	.	II	17	+	+	.	.	.	.	+	+	.	+	III	22	.	+	+	.	2	25
Scirpus silvaticus	+	.	.	.	r	.	.	.	1	1	II	196	.	+	.	+	.	+	+	.	.	.	II	22	.	r	.	2	2	440
Cirsium oleraceum	.	.	r	+	.	.	.	+	.	.	II	37	.	.	.	r	+	.	.	.	+	.	II	12	+	.	.	1	2	138
Polygonum bistorta	+	.	.	.	.	+	.	.	.	.	I	11	.	+	.	.	.	.	+	.	.	1	II	11	.	.	.	.	.	.
Myosotis palustris	+	.	.	.	.	.	.	1	.	.	I	61	.	+	.	+	.	.	.	.	1	+	II	57	.	.	.	.	.	.
Lathyrus palustris	.	+	2	.	.	.	.	.	.	.	I	200	1	.	+	+	.	.	.	1	.	.	II	113	.	.	.	+	1	138
Juncus conglomeratus	.	.	.	.	+	.	.	+	.	.	I	11	.	.	.	+	.	+	.	.	+	.	II	17	.	.	+	.	.	13
ChAll. *Molinion*																														
Iris sibirica	.	.	.	+	.	.	+	.	.	.	I	11	.	.	.	+	.	.	.	.	.	.	I	6	+	1	+	+	4	163
Silaum silaus	.	.	.	.	+	.	.	.	.	+	I	6	r	+	.	.	.	+	r	+	.	.	III	19	.	.	+	.	1	13
ChAll. *Filipendulion*																														
Filipendula ulmaria	+	+	3	2	.	1	1	2	+	+	V	933	1	.	.	.	+	.	.	+	.	.	II	67	1	2	1	1	4	826
Lythrum salicaria	.	.	.	+	.	.	+	+	.	.	II	17	.	.	+	+	1	.	.	.	+	+	III	72	2	+	.	1	3	575
Lysimachia vulgaris	.	+	.	.	.	1	.	.	+	.	II	67	+	.	.	+	.	.	.	+	1	1	III	67	+	1	r	+	4	153
ChO. *Molinietalia*																														
Deschampsia caespitosa	2	1	1	2	2	2	3	3	1	+	V	1 046	2	.	1	2	+	2	+	+	1	1	V	690	2	.	3	1	3	1 500
Cirsium palustre	1	.	2	1	1	.	+	.	+	.	IV	372	.	.	.	1	1	.	.	1	.	+	II	167	1	1	2	.	3	688
Lotus uliginosus	.	1	2	.	+	1	1	.	2	+	IV	561	.	.	2	.	1	1	.	.	.	.	II	306	+	2	1	.	3	575
Galium uliginosus	+	.	.	.	.	+	+	.	.	+	II	17	+	+	.	.	+	.	+	+	.	.	III	28	+	.	.	.	1	13
Angelica sylvestris	.	.	.	+	+	.	.	.	+	.	II	17	.	.	.	+	.	.	.	.	+	+	II	11	.	.	.	+	1	13
Sanguisorba officinalis	+	.	.	.	.	+	.	.	.	+	I	17	.	.	.	+	.	.	+	.	.	.	II	11	.	.	.	.	.	.

TABLE 1 – cont.

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
ChO. *Arrhenatheretalia*																														
Achillea millefolium	+	1	1	.	.	.	.	2	1	1	III	367	1	+	.	1	.	1	1	r	2	.	IV	439	+	.	.	.	1	13
Daucus carota	.	.	+	+	1	.	1	.	1	.	III	122	+	+	1	.	1	.	.	+	+	1	IV	133	.	+	.	.	1	13
Taraxacum officinale	+	+	.	.	.	+	.	+	.	+	III	22	.	.	.	+	.	+	+	.	.	.	II	17	.	.	+	+	1	25
Lotus corniculatus	+	+	1	.	.	.	.	+	+	.	II	72	.	.	.	+	.	.	1	.	.	.	I	56	.	.	.	.	.	.
ChCl. *Molinio-Arrhenatheretea*																														
Festuca rubra	2	2	2	2	+	2	1	+	2	1	V	1 233	+	.	2	+	1	+	+	3	.	+	IV	610	+	2	+	+	4	475
Holcus lanatus	2	2	+	1	1	2	+	1	+	.	V	767	1	2	+	2	+	+	1	+	2	1	V	717	3	r	.	.	2	940
Alopecurus pratensis	r	+	+	2	1	1	2	r	2	1	V	708	.	.	1	+	1	.	.	+	.	1	III	122	+	1	2	+	4	588
Poa pratensis	1	.	.	+	+	1	3	1	2.	+	IV	767	+	.	.	.	.	.	+	+	1	+	III	72	.	+	1	1	3	262
Ranunculus acris	1	+	+	.	+	.	2	.	+	.	III	272	2	3	1	.	r	2	+	1	+	+	V	923	+	+	1	.	3	150
Rumex acetosa	.	+	+	.	.	.	+	.	+	.	II	22	.	.	+	+	.	.	1	.	.	.	II	67	.	.	.	+	1	13
Plantago lanceolata	.	.	+	+	.	.	+	r	.	.	II	22	+	+	.	.	.	1	.	.	+	.	II	72	.	+	+	.	2	25
Poa trivialis	1	.	2	.	.	.	1	2	.	.	II	500	.	.	.	+	.	.	+	+	.	.	II	17	+	+	1	.	3	140
Vicia cracca	+	+	.	.	.	3	.	.	.	+	II	428	.	.	.	.	.	.	1	.	.	.	I	56	.	.	.	.	.	.
Cerastium holosteoides	+	.	.	.	.	.	.	+	.	+	II	11	+	+	.	.	.	1	.	.	+	.	II	72	.	+	.	.	1	13
Trifolium pratense	.	.	.	+	.	.	.	.	+	+	II	11	.	.	+	+	.	.	.	.	.	.	I	11	.	.	.	.	.	.
Phleum pratense	+	+	.	.	.	.	.	.	.	1	II	11	+	.	.	.	+	.	.	+	.	.	II	17	+	.	.	.	1	13
Ranunculus acris	+	.	.	.	.	.	.	.	.	.	I	6	.	.	+	+	.	.	.	.	.	.	I	11	.	.	.	.	.	.
Attendant species																														
Ranunculus repens	+	1	.	2	.	+	2	+	1	1	IV	906	+	+	+	r	+	1	r	r	2	2	V	276	1	1	2	+	2	700
Carex gracilis	.	.	+	.	+	.	+	.	+	1	III	17	.	.	.	+	.	.	.	r	.	+	II	7	.	1	+	+	2	150
Poa palustris	.	.	+	+	.	.	.	+	.	+	II	17	+	.	.	+	+	.	.	.	.	.	II	17	+	.	.	+	2	25
Phragmites australis	+	.	.	.	+	1	.	.	.	1	II	67	.	.	+	+	.	.	.	.	.	.	I	11	.	.	+	.	1	13
Trifolium repens	.	.	+	.	.	.	+	.	.	+	II	11	+	.	.	.	+	.	.	+	.	+	II	17	+	.	.	+	2	25
Veronica chamaedrys	.	.	+	.	.	+	.	.	.	.	I	11	.	.	.	+	.	.	.	.	+	.	II	11	.	.	+	.	1	13
Potentilla anserina	.	.	.	.	.	.	.	.	+	.	I	6	+	.	.	+	.	.	.	+	.	.	II	17	+	.	.	+	2	25
Mentha arvensis	.	.	.	.	.	.	.	+	.	.	I	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Sporadic species: *Agropyron repens* 8 (+), *Agrostis canina* 23 (r), *Alchemilla pastoralis* 2 (r), *Alopecurus geniculatus* 8 (1), *Avenula pubescens* 24 (+), *Cardamine pratensis* 23 (r), *Carex fusca* 13 (+), *Carex hirta* 14 (+), *Carex rostrata* 15 (+), *Centaurea jacea* 17 (r), *Comarum palustre* 17 (r), *Equisetum palustre* 21 (r), *Festuca arundinacea* 21 (1), *Galeopsis pubescens* 5 (+), *Galium mollugo* 6 (+), *Geranium pratense* 19 (+), *Glechoma hederacea* 13 (r), *Juncus conglomeratus* 24 (r), *Lolium perenne* 9 (1), *Luzula pilosa* 11 (+), *Lysimachia nummularia* 21 (+), *Medicago lupulina* 6 (+), *Mentha arvensis* 1 (+), *Phalaris arundinacea* 2 (r), *Plantago media* 1 (r), *Potentila anserina* 24(+), *Prunella vulgaris*, *Ranunculus repens* 11 (1), *Thalictrum flaum* 14 (+), *Trifolium repens* 13 (+), *Viola palustris* 2 (r).
List of localities of phytosociological releves in Table 1: M – Mirosław; R – Radolin; N – Nowe Dwory; F – Folsztyn; L – Lubcz Mały.

Denisiuk and Grynia (1965), as well as Brzeg and Ratyńska (1989) consider the community as worthless. Merchant (1993) maintains that it is a community of rich floristic composition which also occurs in wet land depressions, around ponds and on degraded peat bogs (Ilnicki 2002) but according to some researchers (Kępczyński and Rutkowski 1985, Brzeg and Ratyńska 1989, Fijałkowski 1991, Ervin and Wetzel 2002) in such situations its floristic composition is poorer. In the above described situation, tussocks of soft rush constituted a protection for the pond waters against mechanical degradation and also sheltered communities of pond hydrophytes acting as ecological guards as described by Agnew (1961).

Characterisation of site conditions

The examined soils developed as a result of the alluvial action of the Noteć River. The underlying well irrigated alluvial sand is usually covered by a layer of mineral silty sediment of varying thickness (profile 2: 0.40-0.95 m, profile. 3: 0.68-0.82 m) (Table 2).

The above mentioned horizons, characterised by a very low water permeability, result in a long-term (practically speaking – permanent) stagnation of precipitation waters. In the case of profile 1, at the depth of 0.48 to 1.07 m, a similar role is played by the organic-silty gyttia horizon (Ilnicki 2002). Consequently, moisture levels of the top soil layers are definitely far too high for proper meadow and pasture utilization. It amounted from 0.6514 $m^3 \cdot m^{-3}$ – muck to 0.7611 $m^3 \cdot m^{-3}$ – peat (profile 3) and from 0.3022 (profile 2) to 0.3568 $m^3 \cdot m^{-3}$ (profile 1) for sands (Table 3).

In all cases, these values were slightly lower than total porosity, in other words, almost equal to maximum water capacity (Table 3). A similar geobotanical cause supporting the occurrence of *Epilobio-Juncetum effusi* was indicated by Denisiuk and Grynia (1965) who also emphasized its occurrence in similar sites situated at small depths of silt layers. This formation which was deposited several dozen centimeters under the surface also led to water stagnation and maintained high soil moisture content within the entire pedone.

The top layers of the examined soils were made up of peat of varying degrees of decomposition (profile 1 – peat soil), as well as muck formations (profile 3 – peat--muck soil) and mucky soils (profile 2 – proper mucky soil) and exhibiting different, local stages of degradation (evolution) caused by the subsidence process (Table 3). All organic formations showed considerable silting up which exerted a distinct influence on their physical

Table 2. Taxonomy and morphology of investigated soils

Profile number/ Object/ Soil management	Taxonomy of investigated soils				Horizon	Depth	Water depth (m)
	division	order	type	subtype			
1 Mirosław Meadow	hydrogenic	bog	peaty	peaty-low	POtni(R2) Otni(R1) Ogygg Dgg	0.00-0.22 0.22-0.48 0.48-1.07 1.07-1.50	0.25
2 Radolin Pasture	hydrogenic	post-bog	mucky-like	mucky-like typic	Ae Cn IICgg	0.00-0.40 0.40-0.95 0.95-1.50	0.32
3 Radolin Barren land	hydrogenic	post-bog	muck	peaty-muck	Mt Otni(R2) IICn D	0.00-0.32 0.32-0.68 0.68-0.82 0.82-1.50	0.09

According to Polish Society of Soil Science.

Table 3. Basic properties of investigated soils

Profile number	Horizon	Organic or mineral formation	Moisture ($m^3 \cdot m^{-3}$)	Specific density ($Mg \cdot m^{-3}$)	Bulk density ($Mg \cdot m^{-3}$)	Porosity ($m^3 \cdot m^{-3}$)	pH in 1 M KCl	Organic matter (%)
1	POtni(R2)	peat	0.7500	1.98	0.41	0.7929	5.51	42.54
	Otni(R1)	peat	0.7104	2.20	0.55	0.7505	4.68	31.47
	Ogygg	gythia	0.7426	2.23	0.36	0.8388	6.27	28.80
	Dgg	sand	0.3568	2.65	1.57	0.4075	5.92	1.20
2	Ae	mucky-like	0.4429	2.41	1.02	0.5775	6.06	12.41
	Cn	silt	0.3268	2.46	1.04	0.5772	6.20	8.44
	IICgg	sand	0.3022	2.64	1.72	0.3484	5.65	0.97
3	Mt	muck	0.6514	2.28	0.51	0.7763	6.44	24.39
	Otni(R2)	/peat	0.7611	2.11	0.43	0.7960	5.70	40.23
	IICn	silt	0.4286	2.44	1.03	0.5779	6.33	7.98
	Dgg	sand	0.3248	2.65	2.65	0.3625	6.28	1.07

properties. Honczarenko (1963) blames the "invasion of soft rushes" for improper soil physical properties, especially poor porosity leading to excessive moisture content. Porosity, as well as other properties of the examined soils, can be considered appropriate (from agricultural point of view) and characteristic for soils of similar composition and typology (Honczarenko 1963, Gajewski et al. 2006, Mocek et al. 2006) (Table 3). The main reason of the excessively high soil moisture content is the occurrence in them of poorly permeable organic-silty or sediment-silty layers causing water stagnation in surface horizons (Okruszko 1971).

CONCLUSIONS

1. On the examined grasslands, as well as wasteland situated along the Noteć River valley, frequent occurrence of the *Epilobio-Juncetum effusi* association was observed whose dominant and characteristic species was *Juncus effusus* and sporadically *Epilobium palustre* and *Juncus articulatus*.

2. The sward on the meadow and wasteland is being overtaken by numerous species of high stability and coverage coefficient, such as: *Deschampsia caespitosa*, *Festuca rubra*, *Filipendula ulmaria*, *Holcus lanatus*, *Alopecurus pratensis* as well as *Ranunculus regens* and *Poa pratensis*. They occupy higher sward layers characterised by the best lighting conditions. The most frequent species occurring in the lower sward layers include: *Lotus uliginosus*, *Geum rivale*, *Poa trivialis*, *Vicia cracca* and *Lythrum salicaria*.

3. The observed deteriorating physical soil properties, especially low porosity and increased soil moisture content, exert a decisive influence on the occurrence of *Juncus effusus*.

4. It was found that profuse and dense tufts of *Juncus effusus* form and develop well on areas with excessively moist, compacted soils characterised by almost complete lack of air. In these soils, surface organic layers are deposited on shallow alluvial sands with a poorly permeable layer of gyttia and peat situated at the depth of 40 to 90 cm.

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