HACQUETIA 11/1 • 2012, 5–15

DOI: 10.2478/v10028-012-0001-6

SUCCESSION MODEL WITH *CORYNEPHORUS CANESCENS* IN ABANDONED SANDY FIELDS (W SLOVAKIA)

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Abstract
The succession of vegetation on acidic sandy fields after abandonment was studied and obtained results were compared with similar data from eastern part of Europe. The vegetation changes head towards oligotrophic *Corynephorus*-grasslands, because nutrients from the upper layer of soils are gradually washed out. Dry, occasionally blowing sand enables the growth of psammophytes very well. The paper compares the succession models on abandoned sandy fields, and semi-natural acidic sandy dunes in western part of Slovakia, southern Moravia, Hungary and Croatia. In spite of amazing similarities, some differences are displayed using spectra of life forms and presentation of weeds.
Keywords: arable land, inland sand dunes, weed, *Corynephorion*, Borská nížina Lowland.

Izvleček:
Proučevali smo sukcesijo vegetacije na opuščenih kislih peščenih poljih in primerjali rezultate s podobnimi podatki iz vzhodne Evrope. Spremembe vegetacije so usmerjene proti oligotrofnim traviščem z vrsto *Corynephorus,* saj se hranila postopomo izperejo iz zgornjih talnih plasti. Suh pesek, ki ga občasno prinese veter omogoča uspevanje psamofitom. V članku smo primerjali sukcesijske modele na opuščenih peščenih poljih in polnaravnih kislih peščenih Dinah v zahodnem delu Slovaške, južne Moravske, Madžarske in Hrvaške. Kljub veliki podobnosti smo izpostavili določene razlike s spektrom življenskih oblik in prisotnostjo plevelnih vrst.
Ključne besede: obdelana tla, celinske peščene dine, pleveli**,** *Corynephorion*, Borská nížina.

1. INTRODUCTION

The *Corynephorus*-grassland represents widespread pioneer vegetation on active mobile dunes along the exposed Atlantic coasts from Portugal to Denmark. It occur regularly along the southern Baltic Sea (Hultén & Fries 1986: map 342) and decline as inland sand dune grasslands in the Central and Eastern European lowlands (Rychnovská 1963, Hršak 2004, Lájer 2004). The natural *Corynephorus*-grassland prefers acidic sands, but the particular species *Corynephorus canescens* occurs also on neutral or slightly basic dunes. For a growth of *C. canescens* is much more important open sandy substratum which is unstable, than accurate pH value, because this grass can autonomously regulate the soil pH by its root system (Rychnovská 1963).

Beside dominant *Corynephorus*, another psammophytes with constant frequency are present, such as *Acetosella vulgaris, Agrostis tenuis, A. vinealis, Hypochoeris radicata, Jasione montana, Logfia minima, Pilosella officinarum, Spergula morisonii, Teesdalia nudicaulis*. This species assemblage well defines the dry acidophilous and nutrient-poor plant communities of the alliance *Corynephorion canescentis* Klika 1931 in larger European region (cf. Korneck 1978, p. 32, Dengler 2004). Some taxa with atlantic and subatlantic distribution, e.g. *Ammophila arenaria* or *Carex arenaria* differ west European stands from those occurred more eastern, but generally, the species composition of alliance

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is conspicuously uniform. This fact is recently well known and achieved by analyses based on large data from whole Europe (cf. Dörsing 2008).

Succession in abandoned fields and sandy areas has been investigated in numerous older studies (e.g. Prach 1985, Tilman 1987, Faliński et al. 1993) but is still very attractive for recent investigations (e.g. Putten et al. 2000, Csecserits & Rédei 2001, Deng 2001, Ejrnæs et al. 2003, 2008, Koubková 2007, Török et al. 2008). The secondary succession on sandy soils obviously heads towards pine forest communities (Prach et al. 1993), but in special situation gives a chance for possible renaturalization of abandoned fields towards sandy semi-natural grasslands. A lower attention was given to the stands, where the sandy vegetation was fully destroyed, and for longer time managed as crop fields.

The aim of the paper is (i) to describe processes of succession on sandy soils, partly on natural dunes, but predominately on secondary stands; and (ii) to compare some succession models, known from eastern part of Europe with situation in abandoned fields in Slovakia.

2. MATERIAL AND METHODS

A total of 21 phytosociological relevés were carried out in the Borská nížina Lowland, equally from abandoned fields (10 rels.) as well as near natural dunes (11 rels.) in accordance of the Braun-Blanquet approach. The relevés were entered to the Turboveg database (Hennekens & Schaminée 2001) and classified using modified TWINSPAN classification (Hill 1979, Roleček et al. 2009) and carried out by using JUICE software (Tichý 2002). All imput data are stored in Central database at the Institute of Botany (http://ibot.sav.sk/cdf). The final table depicts result of comparison of 52 relevés with similar stands found in East European regions (Hršak 2004, Lájer 2004, Koubková 2007), and with earlier stadium from the similar localities (Májeková 2005). The sorting of taxa to group of psammophytes and weeds in large extends follows index prepared by Jurko (1990). The spectra of life forms were calculated according this source as well. The abbreviations – T (therophytes = annuals and bienniales), H (hemicryptophytes), G (geophytes), C (chamaephytes), P (phanerophytes), M (mosses), and L (lichens). The nomenclature of plant species follows Marhold & Hindák (1998).

3. RESULTS

The TWINSPAN classification separates in the first step the relevés from abandoned crop fields and group of those stands, which were under human impact but without agronomical and agrochemical procedures. While the first group (column A-B in Table 1) represents the development after abandonment of crop fields, the next three columns depict the succession on mechanically disturbed sandy areas. The fertilization and cultivation of fields in the past is manifested by presence of numerous weeds, e.g. *Anthemis ruthenica, Conyza canadensis, Digitaria sanguinalis* and many others. Especially in the earlier phases after abandonment, the fields are covered by nitrogen demanding plants, such as *Agrostis gigantea, Chenopodium album, Crepis tectorum, Elytrigia repens* or *Echium vulgare*, later the nutrients are rather quickly and easily wash out and the abundance of weeds changed in favour of more oligotrophic weeds, such as *Agrostis capillaris*, *Digitaria sanguinalis*, *Trifolium arvense* etc. (see column B in Table 1). The dry sand on the upper layer of soil prefers psammophytes. The *Corynephorus canescens*, together with shallow rooted therophytes, such as *Logfia minima, Spergula morisonii, Teesdalia nudicaulis, Veronica dilenii,* occupied the washed sand, but the nutrients in the deeper layer of soils give a sufficient conditions for growth of some weeds, like *Hypochoeris radicata*. The percentage of therophytes in column A is conspicuously high (59%, see Figure 1, 2).

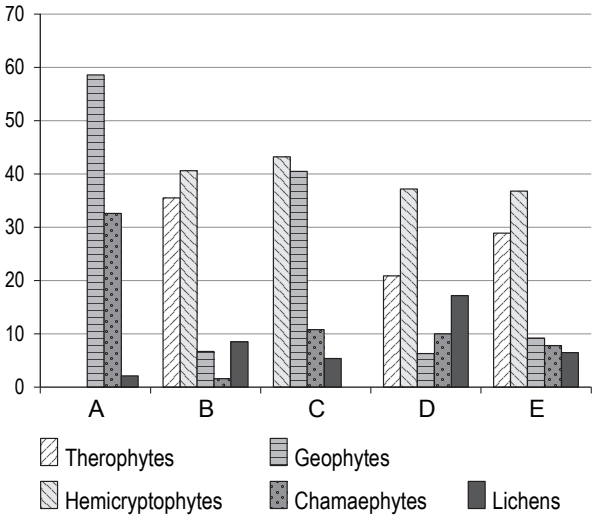

Figure 1: Percentage spectra of selected life forms in columns A–E.
Slika 1: Spekter izbranih življenskih oblik v odstotkih v stolpcih A–E.

Figure 2: Weed *Echium vulgare* is replaced by oligotrophic *Jasione montana* and *Logfia minima*.
Slika 2: Plevel *Echium vulgare* nadomestita oligotrofni vrsti *Jasione montana* in *Logfia minima*.

The succession on open sandy dunes started obviously with acidophilous mosses – *Polytrichum piliferum* and lichens of the genus *Cladonia*. This model on the abandoned fields was not observed. Only sporadic were found lichens, often the *Cladonia fimbriata*. The result is partially misrepresented, because in some published data the cryptogamic flora has been overlooked (cf. Láyer 2004, column C, in Table 1).

In the column D are associated data from military grounds and ranges in Moravia and Slovakia, where traditionally absent agronomical interventions, but large areas (several hectares) are under extensive disturbance due military activities. The number of psammophytes here is much higher and positive correlate with size of area and availability of propagules from neighbouring habitats (sandy grasslands and pine forests of *Dicrano-Pinion* alliance). Here is also high percentage of lichens in the relevés, 17% (Figure 1), while the role of therophytes is suppressed (Figure 3).

A last column (E) differentiates species like *Artemisia campestris, Carex praecox, Tithymalus cyparissias*, and *Festuca vaginata*, all plants typical for sandy soils with neutral or slightly basiphilous reaction.

4. DISCUSSION

Natural (near-natural) stands on sandy dunes

The natural pioneer communities from the alliance *Corynephorion canescentis* are generally poor in vascular plants but rich in lichens, primarily of the genus *Cladonia* (Table 1, Figure 4). The floristic composition of herb layer is conspicuously uniform in whole area of its distribution. Among initial components of natural succession belongs mostly *Spergula morisonii, Teesdalia nudicaulis*, *Veronica dilenii* (cf. Juśkiewicz-Swaczyna 2009); in Eastern Europe also *Thymus serpyllum* (Chytrý 2007). Stands of *Corynephorus*-grasslands are obviously in this region named like separate association *Thymo angustifolii-Corynephoretum canescentis* Krippel 1954 and more dense grasslands than as the *Festuco dominii-Corynephoretum* Borhidi (1958) 1996. These are differentiated by Pannonian or continental species such as *Carex ericetorum, Dianthus armeriastrum*, *D. serotinus,*

Figure 3: *Corynephorus*-grasslands in military range near Malacky, Krížnica.
Slika 3: Travišča z vrsto *Corynephorus* na vojaškem vadbišču pri naselju Malacky, Krížnica.

Figure 4: *Corynephorus canescens* growing in lichen carpet.
Figure 4: Vrsta *Corynephorus canescens* uspeva na preprogi lišajev.

Festuca vaginata subsp. *dominii, Thymus serpyllum* subsp. *angustifolius, Veronica dillenii, Viola kitaibeliana* and some others taxa (cf. Hršak 2004, Lájer 2004).

Vicherek (1972) documented the easternmost occurrence of such sand dunes steppes near Kiev (Ukraine), where the taxon *Spergula morisonii* is very rare; therefore these stands were associated to the *Veronico dillenii-Corynephoretum* Passarge 1960, which Vicherek considered as subcontinental vicariate association.

In recent studies (Chytrý 2007, Dörsing 2008, Juśkiewicz-Swaczyna 2009) the authors unified all stands, formerly described under the various names, into one association, the *Corniculario aculeatae-Corynephoretum canescentis* Steffen 1931 (Syn.: *Spergulo morisonii-Corynephoretum canescentis* R. Tx. (1928) 1955; *Spergulo vernalis-Corynephoretum canescentis* R. Tx. (1928) Libbert 1933) and certain differentiation lies only on level of subassociations (Dörsing l.c.), variants or geographical races (Juśkiewicz-Swaczyna l.c.).

Secondary stands on sandy fields

The secondary grasslands with dominance of *Corynephorus*, sporadically developed on abandoned crop-fields after several years, showed differences against the above discussed stands of the *Cornicularia aculeatae-Corynephoretum canescentis* association.

There are noticeable differences between habitats, which were ploughed, and then after 2 or 3 years afforested again by pine trees, or which were deforested, and for longer time exploited as crop-fields. As an example of succession on young pine plantings can be emphasized study by Šomšák (1976). He observed fallows on sandy soils in Borská nížina lowland and described than typical plant community *Setario viridis-Erigeronetum* Šomšák 1976. These stands are characterized by dominance of many weeds, like *Conyza canadensis*, *Agrostis tenuis, Setaria viridis, Carex hirta, Apera spica-venti* combined with lower presence by psammophytes such as *Corynephorus canescens*, *Festuca vaginata* subsp. *dominii,* and *Logfia arvensis*.

22 years long succession on abandoned sandy fields in Denmark studied Deng (2001). According his observation the annual weeds fade out as first (during 3–5 years) and *Jasione montana* and *Acetosella vulgaris* became dominant, slowly supplement with persistent perennials such as *Piloselle officinarum*. The *Corynephorus canescens* grows

Figure 5: Abandoned field near Studienka with psammophyte vegetation.
Slika 5: Opuščena polja pri naselju Studienka s psamofitsko vegetacijo.

generally in this field very sparsely and after 12 years completely disappeared and whole field returned to *Calluna vulgaris* heathland. Faliński et al. (1993) studied vegetation dynamic on the abandoned sandy farmlands during secondary succession in Poland. The pioneer phase of vegetation after 2–3 years of the abandonment represent weed plants such as *Digitaria ischaemum, Spergula arvensis* accompanied by herbaceous perennials, among which psammophytes prevail – *Jasione montana, Helichrysum arenarium, Hieracium pilosella, Hypericum perforatum, Hypochoeris radicata, Acetosella vulgaris, Solidago virgaurea,* etc. The occurrence of psammophilous grass *Corynephorus canescens* as well as therophytes like *Logfia minima* is also characteristic (Figure 5).

The floristic correspondence with abandoned fields in Borská nížina lowland here is remarkable. The phase with *Juniperus communis* (cf. Faliński et al. 1993) is not common in our study site, but final phase to stable pine forests after more than 100 years after the field abandonment should by one alternative also in Slovakia, but required to stop human impact to the fields (artificial forestation, repeated transformation into crop-fields, urbanization, etc.) for so long time.

Succession models

Typical succession model on natural acidic sandy dunes is generally described as (a) phase with open, shifting sand (dominate mosses and lichens), practically without vascular plants except the first tuft of grass *Corynephorus canescens,* (b) phase of dry grasslands with psammophytes

such as *Pilosella officinarum Jasione montana,* etc., (c) phase of closed grasslands with dominate *Festuca* sp. div., and (d) development towards *Calluna vulgaris*-heathland or direct to various oak pine forests. The primary succession is relatively slow. Small-scale disturbances (anthills, molehills, and holes) keep the process of succession towards sand grasslands in equilibrium for longer time (Jentsch et al. 2002, Tschöpe & Tielbörger 2010).

Different situation is on sandy fields. Accumulation of organic matter gives gradually the opportunity for more demanding plants and onset of next phases with various nitrophilous and mesophilous plants (Ejrnæs et al. 2003). Very frequent situation is that fields are attack by rather specialized invasive aliens, in first stage annuals, herbaceous weeds and neophytes already present in the seed bank, latter also by persistent perennials (Van der Putten et al. 2000) and finally by alien woody species, such as *Acer negundo* and *Robinia pseudoacacia* (Pyšek et al. 1998). Hršak (2004) found direct relation between accumulation of organic matter and nutrients and changes in floristic pattern on sandy dunes in Croatia. Starting plants, like *Corynephorus canescens* and *Festuca vaginata* are replaced by *Calamagrostis epigeios, Conyza canadensis, Oenothera biennis, Solidago gigantea,* and shrubby *Sambucus nigra*. Very similar succession model is common also in our study area.

In southern Moravia Koubková (2007) investigated floristic variability and secondary succession in sandy vegetation on disturbed open sands after three decades, when J. Vicherek started study this vegetation. The results showed that soil pH did not change markedly, but the number of species with affinity to nutrients, soil moisture and neutral reaction (in sense to Ellenberg indication values) increased.

Secondary succession on abandoned fields with tendency to return toward more or less natural or near-natural vegetation is not typical phenomenon. Nevertheless, on sandy fields, where the low amount of nutrients eliminate demanding ruderal species during 10 years after abandonment (Csecserits & Rédei 2001) the succession model head towards higher abundance of psammophytes. The nutrient poor soils support sand specialists and pioneer species of the open dunes, such as *Spergula morissonii* and others. The abandonment of fields with nutrient poor soils may lead to the formation of semi-natural grasslands, especially in situation, when propagules in seed bank or from neighbouring habitats are present (cf. Ejrnæs et al. 2008, Šefferová Stanová et al. 2011). Appropriate management on similar stands give a chance to create conditions for recover of rare plant populations and Natura 2000 habitats typical for acidophilous open sandy dunes, such as 2340 – Pannonic inland dunes, and 6260 – Pannonic sand steppes (Stanová & Valachovič 2002).

5. ACKNOWLEDGEMENT

The author acknowledges to specialist for kindly determination of some hardly distinguishable taxa, P. Šmarda (*Festuca*), M. Peniašteková (*Scleranthus*), I. Pišút and A. Dingová (*Cladonia*). The research was supported from the Grant Agency of Slovak Academy of Sciences VEGA No. 0181 (Dynamics and succesion of grassland vegetation) and VEGA No. 0672 (Diversity changes in neighbouring zones with agrocoenoses).

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7. APPENDIX

Table heads:

Column A, 6 rels., all by Májeková 2005 (orig. tab./rel.: 12/23, 12/24, 13/3, 12/25, 12/28, 12/27, made during years 2003–2004, on abandoned fields N from Studienka village, Borská nížina Lowland. **Column B, 13 rels**., 3 rels. (27–29) Májeková 2005 (orig. tab./rel.:7/1, 8/1, 13/6, all on abandoned fields N from Studienka village + 10 rels. made by author during year 2010 – number in table, date (yymmdd), plot (m^2), altitude (m a.s.l.), cover total (%), cover E_1 and E_O (%), specific locality:

52	101001	20	184	50	30	20	Šajdíkove Humence, field near railway
49	100729	20	219	70	60	10	Lakšárska Nová Ves, field W from village
51	100101	20	180	70	20	70	Šajdíkove Humence, field near railway
44	100713	20	200	50	50	0	Lakšárska Nová Ves, field towards Šišoláky
45	100713	20	199	50	50	0	Lakšárska Nová Ves, field towards Šišoláky
41	100713	20	226	60	55	3	Studienka, field N from village
43	100713	20	203	60	60	3	Studienka, (Čechovec 198 m), aband. field
42	100713	20	199	50	50	1	Studienka, (Čechovec 198 m), aband. field
48	100729	20	165	50	50	2	Borský Sv. Jur, towards Tomky settlement
50	100923	20	223	80	60	70	Studienka, field N from village

Column C, 7 rels. (11–17) made by Lájer 2004 (orig. tab./rel.: 1/1–7, during 2000–2001 in Bolsó-Somogy in Hungary). **Column D, 16 rels**., 5 rels, Koubková 2007 (orig. tab./rel.: 1/4, 8, 29, 58, 59) surroundings Bzenec in Moravia) + 11 rels. made by author – number in table, date (yymmdd), plot (m^2), altitude (m a.s.l.), cover total (%), cover E_1 and E_O (%), specific locality:

32	960811	10	190	75	50	50	Malacky, border of military range
33	010630	25	192	70	60	50	Malacky, border of military range
35	930731	12	215	60	40	60	Malacky, Orlovské vršky, open dunes
39	090526	16	206	80	30	75	Mikulášov, Bežnisko, milit. range
37	080516	7	196	80	75	10	Malacky, Krížnica, air range
40	090607	16	194	65	17	55	Malacky, Krížnica, air range
34	020630	25	190	75	60	40	Malacky, border of military range
47	100722	20	199	85	65	25	Malacky, Krížnica, air range
46	100722	20	200	80	45	70	Malacky, Krížnica, air range
38	090601	16	195	90	40	90	Malacky, border of military range
36	090526	16	169	90	20	80	Mikulášov, Bežnisko, milit. range

Column E, 10 rels., 5 rels. (1–10), made by Koubková 2007 (orig. tab./rel.: 1/1, 2, 27, 62, 78), surroundings Bzenec and Hodonín in Moravia); 5 rels. (18–22) made by Hršak 2004, orig. tab./rel.: 1/6, 4, 9, 13, 17), all from Đurdevac Sand Botanical Reservation in Croatia.

Received 16. 5. 2011
Revision received 14. 10. 2011
Accepted 31. 10. 2011

Table 1: Relevés of the *Corynephorus*-grasslands arranged in TWINSPAN order; from most ruderalised sandy fields (columns A–B) to relatively natural- or nature-related stands on the sandy dunes (columns C–E). Life forms (LF) in accordance by Jurko (1990).

Tabela 1: Popisi travišč z vrsto *Corynephorus* urejeni s programom TWINSPAN, od najbolj ruderaliziranih peščenih polj (stolpec A–B) do relativno naravnih in polnaravnih sestojev na peščenih dinah (stolpec C–E). Življenske oblike (LF) so v skladu z Jurko (1990).

Column		A						B												
Relevé number	LF	25	23	26	31	24	30	27	28	29	52	49	51	44	45	41	43	42	48	50
Psammophytes																				
Corynephorus canescens	H	+	.	+	+	+	.	+	.	+	1	3	2	2	2	3	3	3	+	2
Jasione montana	H	.	.	+	.	.	.	+	+	+	.	1	1	2	2	2	2	2	+	2
Logfia minima	T	.	+	+	.	.	.	.	.	r	.	2	1	2	2	2	1	2	3	2
Acetosella vulgaris	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	+	2	2
Veronica dillenii	T	+	.	.	2	.	2	.	.	2	+	+	.	+	.	+	+	.	1	.
Spergula morisonii	T	.	.	1	.	.	.	.	.	3	.	.	.	.	.	.	.	.	r	.
Thymus serpyllum	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Polytrichum piliferum	M	.	.	.	.	.	.	+	+	.	.	.	3	.	.	.	.	.	.	.
Scleranthus polycarpos	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Teesdalia nudicaulis	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Erysimum diffusum agg.	T	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Helichrysum arenarium	H	.	.	.	.	.	.	.	+	.	.	.	.	r	.	.	.	.	.	.
Koeleria glauca	H	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Peucedanum oreoselinum	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dianthus carthusianorum	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Armeria elongata	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca ovina (incl.**guestfalica*)	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca vaginata (incl.**dominii*)	H	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Stipa borysthenica	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Spergula pentandra	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Weed species																				
Conyza canadensis	T	+	1	1	2	1	2	1	1	+	2	1	+	1	+	1	+	+	1	2
Anthemis ruthenica	T	2	2	+	2	5	5	2	2	+	.	+	.	+	+	+	r	+	+	.
Elytrigia repens	G	1	3	+	4	1	2	+	2	+	.	.	.	.	.	+	.	.	.	.
Agrostis capillaris	H	.	.	.	.	.	.	.	.	.	+	+	+	2	2	+	1	+	2	1
Crepis tectorum	T	.	4	.	+	+	2	.	.	.	.	.	.	.	.	.	r	.	.	.
Trifolium arvense	T	2	2	.	2	1	.	+	.	.	2	.	.	.	.	.	+	+	.	+
Logfia arvensis	T	+	.	.	+	+	.	+	.	.	.	+	.	.	.	.	.	.	+	.
Apera spica-venti	T	+	.	.	+	.	.	+	+	.	.	.	.	.	1	+	.	.	.	.
Chondrilla juncea	H	.	.	+	1	.	.	+	5	.	1	+	+	.	.	r	.	+	.	1
Digitaria sanguinalis	T	.	.	3	2	.	.	+	1	.	.	+	.	+	+	.	+	.	+	1

Column	C							D																E									
Relevé number	11	12	13	14	15	16	17	03	04	06	07	08	32	33	35	39	37	40	34	47	46	38	36	01	02	05	09	10	18	19	20	21	22
Psammophytes																																	
Corynephorus canescens	2	2	3	3	4	3	3	2	2	2	3	+	+	1	+	2	3	2	2	2	2	2	2	.	.	2	+	2	2	2	3	2	2
Jasione montana	1	1	.	+	.	.	+	.	.	.	.	.	.	.	1	r	+	.	2	+	1	.	+	.	.	.	.	.	.	r	1	r	.
Logfia minima	.	.	+	+	.	.	1	+	.	+	+	+	.	.	.	.	r	.	2	1	+	.	.	.	.	+	+	+	.	.	.	.	.
Acetosella vulgaris	1	+	1	1	+	.	.	.	+	+	+	+	+	2	.	.	.	.	+	+	+	.	1	.	.	+	+	.	.	2	2	2	r
Veronica dillenii	.	.	1	1	.	1	.	.	1	.	.	.	.	2	.	+	1	+	+	+	1	.	r	.	+	.	.	.	.	.	.	.	.
Spergula morisonii	.	.	.	.	.	.	.	1	+	+	r	+	.	.	+	+	1	+	.	.	+	r	r	+	+	+	.	+	.	.	.	.	.
Thymus serpyllum	.	.	2	.	1	.	1	.	.	.	.	.	.	.	2	2	1	2	.	2	2	.	r	+	.	.	.	.	1	r	.	.	.
Polytrichum piliferum	.	.	.	.	.	.	.	2	1	3	.	.	.	1	.	2	2	2	3	1	3	2	2	5	2	3	2	4	.	.	.	.	.
Scleranthus polycarpos	.	.	1	.	.	.	.	r	+	.	+	1	.	.	.	.	3	.	r	.	.	.	.	+	+	+	.	.	.	.	.	.	.
Teesdalia nudicaulis	+	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Erysimum diffusum agg.	.	.	.	.	.	1	.	.	.	.	.	.	+	1	.	r	.	.	.	.	.	.	r	.	.	.	+	.	.	.	.	.	.
Helichrysum arenarium	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	r	.	1	+	2	.	.	+	.	.	.	.	.	.	.	.	.
Koeleria glauca	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	2	1	.	2	.	2	1	.	.	.	.	.	.	.	.	.	.	.
Peucedanum oreoselinum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	1	+	+	.	+	+	+	r	.	.	.	.	.	.	.	.	.	.
Dianthus carthusianorum	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	+	+	+	+	.	r	.	.	.	.	.	.	.	.	.	.	.
Armeria elongata	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca ovina (incl.**guestfalica*)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	+	.	2	.	2	.	.	.	.	+	2	.	.	.	.	.
Festuca vaginata (incl.**dominii*)	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	2	.	.	.	3	2	r	5	r
Stipa borysthenica	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	+	.	2	.	.	.	.	.	.	.	.	.
Spergula pentandra	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.
Weed species																																	
Conyza canadensis	.	.	+	.	1	.	+	.	.	.	r	2	.	+	.	.	.	.	.	+	+	.	r	.	.	.	.	.	.	.	.	.	.
Anthemis ruthenica	+	+	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Elytrigia repens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agrostis capillaris	.	.	.	1	.	.	.	.	.	.	.	.	.	2	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crepis tectorum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium arvense	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Logfia arvensis	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Apera spica-venti	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chondrilla juncea	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Digitaria sanguinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Acetosa thyrsiflora	H	.	+	+	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia lathyroides	T	.	.	.	+	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Ambrosia artemisiifolia	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cynodon dactylon	G	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1	1	.	1	+	1	+	1	.	.	+	2	1	.	.	.	.	.	.	.	.	.	.	+	1	2	.	+	.	.	.	.	.
Echium vulgare	H	5	.	.	.	.	.	.	.	.	1	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Calamagrostis epigejos	H	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.	.
Erodium cicutarium	T	+	.	.	.	.	2	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Viola arvensis	T	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chenopodium album	T	.	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agrostis gigantea	H	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Solidago gigantea	H	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tragopogon dubius	T	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Papaver dubium s.lat.	T	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plantago lanceolata	H	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Myosotis arvensis	T	.	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Myosotis stricta	T	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum arvense	G	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Arabidopsis thaliana	T	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Setaria viridis	T	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bromus hordeaceus	T	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.
Bromus tectorum	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	+	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	r	.	.	.	.
Artemisia campestris	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	2	.	.	1	2	2	.	.
Artemisia absinthium	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	r
***Cladonia*-lichens**																																																					
Cladonia foliacea	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	2	2	3	2	.	2	.	+	.	.	+	.	.	.	.	.	.	.
Cladonia subulata	L	.	.	.	.	.	.	1	.	.	.	.	3	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	+	.	+	1	+	.	.	.	2	.	.	.	.	.	.	.
Cladonia fimbriata	L	.	.	.	.	.	.	+	.	.	.	1	1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Cladonia rei	L	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	3	.	.	.	.	.	.	.	.	.	.	.
Cladonia pyxidata	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
Cladonia rangiformis	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	3	.	.	.	.	.	.	+	.	2	.	.	.	.	.	.	.	.	.	.
*Cladonia *mitis*	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	1	.	+	.	.	.	3	.	.	.	.	.	.	.	.	.	.
Cladonia coniocraea	L	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Cladonia pleurota	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Cladonia phyllophora	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.
Cladonia furcata	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	.	.	.	.	.	.	2	.	.	.	.	.	.	.
*Cladonia *verticillata*	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	+	.	.	.	.	.	.	.
Cladonia chlorophaea	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Others																																																					
Ceratodon purpureus	M	.	2	.	3	.	1	3	.	.	1	1	2	.	.	.	.	.	1	4	.	.	.	.	.	.	.	.	.	2	.	.	+	+	+	1	2	2	+	2	2	3	2	.	.	3	.	+	.	.	.	.	.
Hypochaeris radicata	H	.	.	.	+	+	+	+	.	.	.	r	.	+	.	r	1	r	+	+	+	+	+	+	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Column		A							B													C							D																		E														
Relevé number		2	2	2	3	2	3	2	2	2	5	4	5	4	4	4	4	4	4	5	1	1	1	1	1	1	1	0	0	0	0	0	3	3	3	3	3	4	3	4	3	3	0	0	0	0	1	1	1	2	2	2
	LF	5	3	6	1	4	0	7	8	9	2	9	1	4	5	1	3	2	8	0	1	2	3	4	5	6	7	3	4	6	7	8	2	3	5	9	7	0	4	7	6	8	6	1	2	5	9	0	8	9	0	1	2
Pilosella officinarum	H	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tithymalus cyparissias	G	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	r	.	+	.	+	.	r	.	r	.	.	.	.	.	.	1	r	+	r	r
Pilosella echioides	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	1	+	.	+	2
Hypericum perforatum	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	+	+	.	+	2	2	+	.	+	.	+	+	.	.	.	.	.	.	.	.
Solidago virgaurea	H	.	.	+	+	.	.	+	+	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	+	2	+	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Cerastium semidecandrum	T	+	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	2	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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Pinus sylvestris	P	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	2	.	.	.	.	.	.
Carex ericetorum	G	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Linaria genistifolia	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	r	.	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agrostis vinealis	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Petrorhagia prolifera	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Pilosella cymosa	H	.	.	.	.	.	.	.	.	.	r	.	+	+	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scleranthus perennis	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	+	r	.	.	.	.	.	.	.	.
Carex praecox	G	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	2	+	.	2	.	.	.	.	.	.	.
Anthoxanthum odoratum	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.
Silene otites agg.	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Achillea millefolium agg.	H	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.
Poa pratensis agg.	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	2	+	.	.	.	.	.	.
Potentilla argentea	H	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	2	.	.	.	.	.	.	.	.
Festuca rupicola	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.
Carex supina	G	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	r	.	.	.
Trifolium alpestre	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.
Sarothamnus scoparius	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	3	.	.
Luzula campestris	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca sp.	H	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Psyllium arenarium	T	.	.	.	.	.	.	4	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Holcus lanatus	H	.	.	.	.	.	.	.	.	.	.	.	.	r	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sedum sexangulare	C	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Acosta rhenana	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Phleum phleoides	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Teucrium chamaedrys	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Senecio jacobaea	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Calluna vulgaris	C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	r	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Danthonia decumbens	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scabiosa ochroleuca	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Poa bulbosa	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

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Asparagus officinalis	G	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.
Senecio viscosus	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lactuca serriola	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Potentilla arenaria	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Arrhenatherum elatius	H	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r
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Brachythecium albicans	M	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	+	.	2	.	.	.	.	.	.	.	.	.
Peltigera rufescens	L	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Racomitrium canescens	M	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cetraria sp.	L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Pleurozium schreberi	M	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.

In one relevé only: *Oenothera biennis* [T] 25: +; *Bryum argenteum* [M] 23: 1; *Papaver *austromoravicum* [T] 23: +; *Veronica arvensis* [T] 24: +; *Vicia villosa* [T] 24: +; *Saponaria officinalis* [H] 24: +; *Holcus mollis* [H] 24: +; *Campanula patula* [H] 24: +; *Holosteum umbellatum* [T] 30: 2; *Crepis foetida* [T] 52: 1; *Brachythecium salebrosum* [M] 52: +; *Silene *alba* [T] 52: r; *Spergula arvensis* [T] 45: r; *Dactylis glomerata* [H] 43: +; *Acetosa pratensis* [H] 43: r; *Scleranthus* x *podperae* [T] 42: r; *Festuca rubra* agg. [H] 50: 1; *Vulpia myuros* [T] 13: +; *Achillea pannonica* [H] 14: +; *Hypericum humifusum* [T] 14: +; *Polygonum arenarium* [T] 15: +; *Muscari comosum* [G] 15: +; *Bromus squarrosus* [T] 16: +; *Petrorhagia saxifraga* [H] 32: 2; *Arenaria serpyllifolia* agg. [T] 32: 2; *Alyssum alyssoides* [T] 32: 1; *Peltigera didactyla* [L] 32: +; *Acinos arvensis* [C] 32: r; *Muscari neglectum* [G] 32: r; *Elytrigia* sp. [G] 33: 1; *Avenula* sp. [H] 33: 1; *Galium verum* [H] 33: +; *Verbascum lychnitis* [H] 33: +; *Thymus pulegioides* [C] 33: +; *Asperula cynanchica* [H] 33: +; *Hypnum cupressiforme* [M] 35: 2; *Veronica officinalis* [C] 35: 1; *Dicranum scoparium* [M] 35: +; *Linaria vulgaris* [H] 35: r; *Poa nemoralis* agg. [H] 4: 1; *Bromus erectus* [H] 4: 1; *Silene viscosa* [T] 39: r; *Cerastium arvense* [C] 39: r; *Erophila verna* [T] 37: +; *Saccomorpha icmalea* [L] 40: +; *Diploschistes* sp. [L] 40: +; *Cladonia coccifera* [L] 40: +; *Cladonia macilenta* [L] 40: +; *Tithymalus strictus* [T] 47: +; *Corispermum leptopterum* [T] 8: +; *Populus sp.* [P] 8: r; *Verbascum phoeniceum* [H] 1: 2; *Bryum* sp. [M] 1: 2; *Cerastium brachypetalum* [T] 1: +; *Seseli osseum* [H] 1: +; *Cyanus segetum* [T] 1: +; *Potentilla collina* [H] 1: r; *Erigeron* sp. [H] 5: +; *Onopordum acanthium* [H] 9: 2; *Thymus pannonicus* [C] 9: 2; *Cerastium glutinosum* [T] 9: 2; *Anchusa officinalis* [T] 9: +; *Elytrigia intermedia* [G] 9: +; *Lepidium ruderale* [T] 9: +; *Medicago minima* [T] 9: +; *Berteroa incana* [T] 9: +; *Anthemis austriaca* [T] 9: r; *Betula pendula* [P] 10: 1; *Dicranum polysetum* [M] 10: +; *Quercus robur* [P] 10: r; *Teucrium montanum* [C] 18: 1; *Alyssum *gmelinii* [T] 18: r; *Hypericum* sp. [H] 18: r;