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A Survey of Ruderal Vegetation in Poland: Phytocenoses with *Rudbeckia laciniata* L., *Solidago canadensis* L. and *S. gigantea* Aiton

Przegląd roślinności ruderalnej na obszarze Polski: fitocenozy z *Rudbeckia laciniata* L., *Solidago canadensis* L. i *S. gigantea* Aiton

INTRODUCTION

Out of a dozen or so North-American species of neophytes brought in accidentally to Poland and other European countries the most expansive are: *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea* (3, 8, 43, 46, 54, 59, 66, 85, 88). They are imposing perennial plants 2–2.5 m high, seldom annual (*Rudbeckia*) or rhizomatous perennial plants (*Solidago*) with a high dynamics of generative and vegetative reproduction (63, 81).

All the three species occur as agresto- or ergasio-epecophytes in vast lowland, upland and submontane areas of Europe (24, 54). Brought in accidentally to Poland they have been expanding since the turn of the 18th century (24). The original and current main route of expansion of those plants extends along the valleys of larger rivers and lowland expanses of lakes. They settle there in various forms of brush wood and in less dense riparian forests. With time they also expand in other habitats and plant communities: from semi-natural (meadows, parks, cemeteries, degraded *Tilio-Carpinetum* and *Querco roboris-Pinetum* forests) to weakly and typically ruderal (areas of industrial facilities, in town and in the country, and traffic routes).

Currently in Poland various habitat forms of phytocenoses with *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea* commonly occur in

lowlands and uplands, less frequently in the mountains up to 600–750 m a.s.l. (24, 63, 81).

THE SCOPE AND METHODS OF INVESTIGATION

Plant communities composed of North-American neophyte species do not yet have, both in Poland and abroad, a strictly defined rank and position in the phytosociological system. That is why this study presents a comprehensive syntaxonomic characteristics of that circle of plant communities investigated in Poland. The most frequently described phytocenoses of those plants, composed of *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea* were taken into consideration.

During the investigations all phytosociological records of those plant communities were used that were found in the available studies, published or in press. They covered 193 phytosociological documentation records (Tab. 6).

The phytosociological records collected were first listed in a working Table * according to their successive similarity in respect of the general floristic structure. The stations of those phytosociological records were presented in Figure 1. The appended Table 6 lists the basic data on the prepared sources of the phytosociological records.

The currently distinguished phytocenoses with the North-American neophyte species with the rank of three associations, and in one case of two subassociations and in the form of one basic plant community, were compared for their floristic structure, syntaxonomic composition and the general physical and chemical properties of their soils (Tabs 1–5).

The statistical floristic and phytosociological structure of the phytocenoses under examination was developed according to the methods by Pawłowski (60). Assignment of the plants to particular syntaxonomic and ecological groups was given mainly after Matuszkiewicz (53) and partly after other authors (8, 59) or at our own discretion (75). The nomenclature of pteridophytes and vascular plants, and bryophytes was given after Jasiewicz (32) and Koponen et al. (45), respectively.

It should be noted that the statistical-floristic data on the phytocenoses described were presented only with such accuracy that they could, if necessary, be continually supplemented with new materials of phytosociological records.

Like syntaxonomic studies of phytocenoses with *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea*, similar studies were earlier carried out on the phytocenoses with *Reynoutria sachalinensis* and *R. japonica* (75).

The following abbreviations were used: cl. — class, subcl. — subclass, div. — group, ord. — order, all. — alliance of plant associations, ass. — plant association, subass. — plant subassociation, comm. — plant community, fac. — facies, dom. — dominant plant species, rec. — record.

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* Not included in this study on account of size.

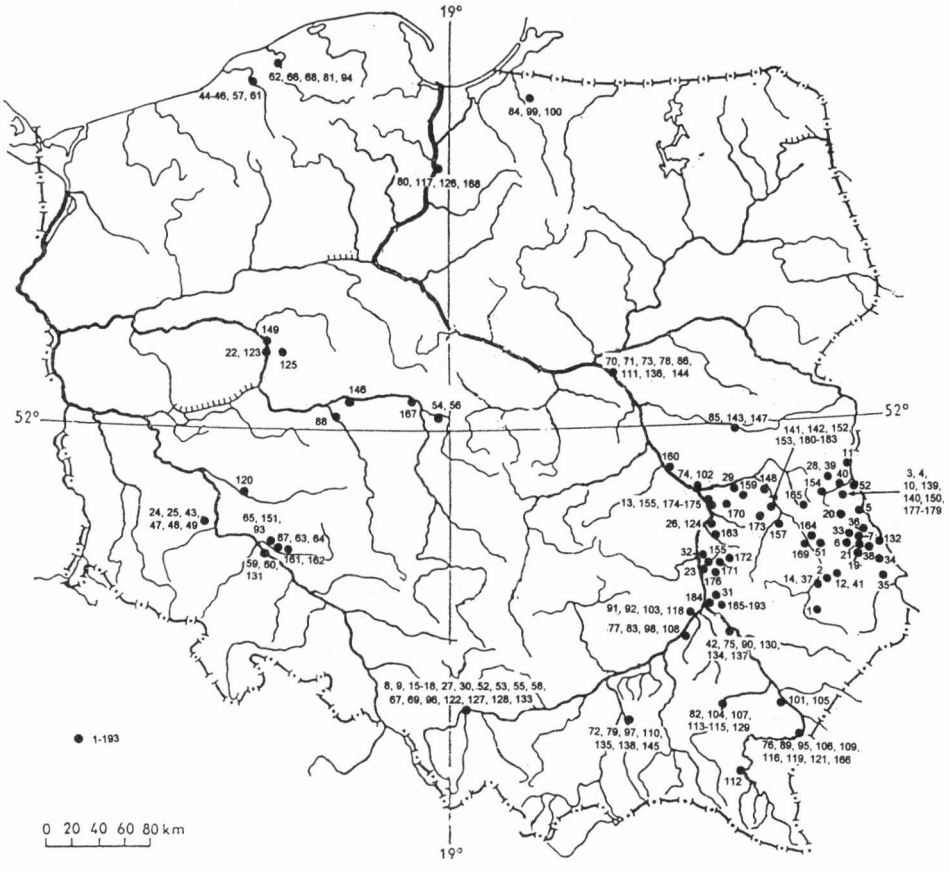

Fig. 1. Map of stations of 193 phytosociological records of phytocenoses: *Rudbeckietum laciniatae* (rec. 1–29), *Solidaginetum canadensis* (rec. 30–60), *Solidaginetum giganteae* (rec. 61–179), and degraded forest *Tilio-Carpinetum* with *Solidago gigantea* (rec. 180–193)

PHYTOSOCIOLOGICAL AND ECOLOGICAL ANALYSIS OF COMMUNITIES

GENERAL CONDITIONS OF INVESTIGATION IN POLAND AND ABROAD

The list of the most frequently described forms of phytocenoses with *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea* in Poland and abroad and their phytosociological taxonomy are the following:

Cl. *Molinio-Arrhenatheretea* ord. *Arrhenetheretalia*. Comm. *Solidago canadensis* (85).
Div. *Convolvulo-Chenopodietalia*. Comm. *Solidago canadensis* (85).
Cl. *Chenopodietea*, ord. *Sisymbrietalia*, all. *Sisymbrion*.
Dom. *Solidago canadensis* in ass. *Atriplicetum nitentis* (22).
Cl. *Artemisietea vulgaris*.

Generally: Comm. *Solidago gigantea* (4, 47). Comm. *Solidago canadensis* (17). Comm. *Solidago canadensis* and *S. gigantea* (87). Comm. *Rudbeckia laciniata* (47). Ass. *Rudbeckio-Solidaginetum* (16). Ord. *Onopordetalia*. All. *Eu-Arction* (= *Arction lappae*). Comm. *Solidago gigantea* (35, 42, 76). Comm. *Solidago canadensis* (17, 62). Comm. *Solidago canadensis* (36). Ass. *Rudbeckio-Solidaginetum* (78). Dom. *Solidago gigantea* in ass. *Tanaceto-Artemisietum vulgaris* (22, 55, 57, 64, 67). *Arctio-Artemisietum vulgaris* and *Leonuro-Ballotetum nigrae* (57, 84) and *Solidaginetum mehletosum* (86) and *Solidago gigantea-Polygonum cuspidatum* (87). Dom. *Solidago canadensis* in ass. *Tanaceto--Artemisietum* (87), Dom. *Solidago canadensis* in ass. *Tanaceto-Artemisietum vulgaris* (6, 10, 21, 22, 25, 39, 49, 55, 67, 68, 85). All. *Solidago gigantea* in ass. *Cirsietum eriophori* and *Resedo-Carductum nutantis* (59). All. *Dauco-Melilotion*. Comm. *Solidago canadensis* (17, 20, 42). Comm. *Solidago gigantea* (17). Dom. *Solidago gigantea* in ass. *Echio--Melilotetum* (59) and *Artemisio-Tanacetum vulgaris* (18, 59). Dom. *Solidago canadensis* in ass. *Echio-Melilotetum albi* and *Centaureo diffusae-Berteroetum incanae* (22, 23, 26) and in *Dauco-Picridetum hieracioides* and *Artemisio-Tanacetum vulgaris* (29, 59). Ord. *Convolvuletalia (Calystegietalia) sepium, Convolvuletalia sepium, Galio-Calystegietalia sepium, Lamio albi-Chenopodietalia boni-henrici, Glechometalia hederaceae*.

Generally: Comm. with *Solidago gigantea*, with *Solidago canadensis* and with *Solidago gigantea-Urtica dioica* (4, 5, 43). All. *Senecion fluviatilis*: ass. *Rudbeckio-Solidaginetum* (1, 11, 12, 15, 37, 38, 68, 69, 72, 74, 77, 79, 80, 89). Ass. *Solidago-Helianthus* (37). Ass. *Cuscuto-Convolvuletum (Calystegietum) sepium* (59). Comm. *Chaerophyllum aromaticum* — *Solidago serotina* (11). All. *Convolvulion sepium*. Dom. *Solidago gigantea* in ass. *Convolvulo-Eupatorietum* (18, 19, 59). Ass. *Impatienti-Solidaginetum* (28, 43, 55). Ass. *Rudbeckio-Solidaginetum* (7, 8, 9). Comm. with *Rudbeckia laciniata* (43, 44). with *Solidago gigantea* (42, 56) and with *Solidago gigantea* and *S. canadensis* (2, 30, 43). All. *Aegopodion*. Dom. *Solidago gigantea* in ass. *Urtici-Aegopodietum podagrariae. Urtico-Cruciatietum* etc. (18, 19, 59).

Cl. (subc.) *Galio-Urticetea*.

Generally: Comm. with *Solidago gigantea* (42, 83, 85). Comm. *Solidago canadensis* (85).

Cl. *Epilobietea angustifolii*.

Generally: Ass. *Rubo-Solidaginetum serotinae* (13, 16, 51). Ord. *Epilobietalia angustifolii*, all. *Epilobion angustifolii*. Ass. *Rubo-Solidaginetum serotinae* (12, 52, 71). Ass. *Solidaginetum canadensis* and *Solidaginetum serotinae* (14, 36). Comm. *Solidago serotina* (31).

Cl. *Trifolio-Geranietea sanguinei*. Ord. *Origanetalia*. Comm. *Solidago gigantea* (59).

Cl. *Querco-Fagetea*. Ord. *Fagetalia silvaticae*, all. *Carpinion betuli*.

Generally: Comm. *Tilio-Carpinetum* with *Solidago gigantea* (70), with *Quercus--Solidago gigantea*, with *Pinus-Rubus hirtus* with *Solidago gigantea* and with *Pinus-Rubus hirtus* with *Pteridium aquilinum* and *Solidago gigantea* (72).

PHYTOSOCIOLOGICAL STRUCTURE AND BIOTOPIC CONDITIONS OF COMMUNITIES IN POLAND

In general, the three associations distinguished — *Rudbeckietum laciniatae, Solidaginetum canadensis* and *S. giganteae* — represent clearly defined forms of phytocenoses that were earlier included in the broadly treated association *Rudbeckio-Solidaginetum* R. Tx. et Raabe 1950.

The same group of plant communities with North-American neophyte species, like the aforementioned association *Rudbeckio-Solidaginetum*, should undoubtedly include other associations with a highly debatable phytosociological rank. These are:

Cuscuto (europaeae) — Convolvuletum R. Tx. 1947;
Rudbeckia laciniata-Solidago canadensis Tx. et Raabe in Tx. 1950;
Solidaginetum Moor, mscr. 1955;
Steneactino-Solidaginetum Oberd. 1957, 1967;
Impatienti-Solidaginetum Moor 1958;
Solidaginetum serotino-canadensis Oberd. in Oberd. et al. 1967.

The same biotopic group, like the aforementioned associations, also includes communities, often described as phytosociologically indeterminate, with the following dominants: with *Rudbeckia laciniata* (48), with *Solidago gigantea* (31, 48, 49, 76) and with *Solidago canadensis* and *S. gigantea* (2). Almost all of those forms of associations and communities with North-American neophytes have been described from various habitats, most frequently from ruderal or seminatural riverside forests (all. *Alno-Padion, Salicion albae*) (e.g. 2, 8, 42, 44, 59, 65). It appears that phytocenoses of that type have been very rarely described from ruderal habitats exclusively. This applies mainly to the association *Helianthus-Solidago* Kępczyńska-Rijken 1977 and to several phytosociological records with the dominant *Solidago gigantea* in the association *Tanaceto-Artemisietum* (10, 63). The recent newly-characterized associations of North American neophyte species of seminatural riverside forests and *Querco roboris-Pinetum* forests include: *Rudbeckio-Solidaginetum serotinae* Fijałkowski 1977, *Rubo-Solidaginetum canadensis* Kędzierawska 1984 after Fijałkowski (mss., 1991), and *Aegopodio-Rudbeckietum* Kędzierawska 1984 after Fijałkowski (mss., 1991).

The examined phytocenoses with *Rudbeckia laciniata, Solidago canadensis* and with *S. gigantea* in Poland were characterized in the following forms:

— Four plant associations: 1. *Rudbeckio-Solidaginetum* (1, 7, 9, 12, 15, 16, 37, 38, 68, 69, 72, 74, 77–80, 89); 2. *Rubo-Solidaginetum serotinae* (12–14, 16, 36, 51, 52, 71); 3. *Rubo-Solidaginetum canadensis* (14, 36); 4. *Aegopodio-Rudbeckietum* (14, 36).

— Four phytosociologically indeterminate communities: 1. with *Chaerophyllum aromaticum* and *Solidago serotina* (11); 2. with *Rudbeckia laciniata* (48); 3. with *Solidago gigantea* (31, 48, 49, 76); 4. with *Solidago gigantea* and *S. canadensis* (2).

— Three different subordinate forms of communities of degraded *Tilio-Carpinetum* (73).

— One facies system of the dominant *Solidago gigantea* in the association *Tanaceto-Artemisietum* (10, 63).

Altogether, the 12 forms named of the phytocenoses of North-American neophyte species are assigned in Poland to 8 highest units: classes, subclasses, groups, 10 orders and 6 alliances of associations. However, in Poland they are classified within 3 classes, 5 orders and 6 alliances of associations (Tab. 6). The studied phytocenoses in the stations investigated so far in Poland represent four basic biotopic groups:

— Ruderal (mainly out of those assigned to cl. *Artemisietea vulgaris* and ord. *Onopordetalia acanthii*).

— Seminatural riverside forests (assigned to cl. *Artemisietea vulgaris*, ord. *Galio-Calystegietalia sepium* and *Convolvuletalia sepium*).

— Degraded *Tilio-Carpinetum* and *Querco roboris-Pinetum* (assigned to cl. *Epilobietea angustifolii*, ord. *Epilobietalia angustifolii* or to cl. *Querco-Fagetea*, ord. *Fagetalia silvaticae*).

— With medial properties between the other three ecological-floristic groups (most frequently assigned to cl. *Epilobietea angustifolii*).

Both in Polish and foreign phytosociological literature the existing ranks and syntaxonomic positions assigned to phytocenoses composed of *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea* are entirely arbitrary and need to be thoroughly revised. This is already demonstrated by the successive ordering alone of the phytosociological records of those phytocenoses examined in Poland in respect of their general floristic structure. It must be noted first of all in Table 6, that the main constituent plants in those phytocenoses, *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea*, co-dominate with each other only in sporadic phytosociological records and with a different degree of cover. It can be generally ascertained that these are phytocenoses with definite single dominant plant species, and at the same time with a typical category of plants characteristic of the association. It also turned out that the phytosociological records listed in the working table, although they come from different biotopic and floristic circles and may represent different stages of development, are not at all differentiated into any distinct biotopic-floristic groups.

The succession development of phytocenoses with *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea* begins with entirely accidental settling of the above neophyte species within less compact ruderal and seminatural communities of different type that are their initial base. That is why those phytocenoses in their early stage of development are very difficult to determine phytosociologically. They can then be regarded subjectively either as subordinate forms of their initial plant communities or as entirely

separate phytocenoses. However, in their optimum stage of development the phytocenoses considerably change their floristic and biotopic properties of the initial stage of development. In the final stage of the optimum development of those phytocenoses there is total domination of a single definite neophyte species at the expanse of the quantity or even presence of most of the earlier settled plants. In the thicket of high neophyte specimens there increases first of all the shading and humidity of the undersoil, and then there is a successive rise in the percentage of humus and litter. In those newly formed biotopic conditions, along with the progressive compactness of neophytes two different phenomena occur at the same time: on the one hand, most of the earlier settled plants recede, mainly photophilous and thermophilous ruderal, meadow and brushwood species, on the other hand, new species settle successively, mainly typically shade-loving hygrophilous, nitrophilous and herbaceous.

It should also be noted that the expanses of those phytocenoses, despite coming by succession from different initial habitats and communities, become with time very much alike for their general phytosociological and biotopic structure. Eventually, those fully developed phytocenoses with *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea* are most often driven out by the numerous settled and growing tree and shrub species. The described cases of the expansion *Solidago gigantea* into dense and degraded *Tilio-Carpinetum* forests (73) are also very interesting.

The foregoing data indicate that the phytocenoses under investigation should not be assigned to higher phytosociological units either within the communities of seminatural marshy meadows *Tilio-Carpinetum* forests and *Querco-roboris-Pinetum* forests (cl. *Artemisietea vulgaris*, ord. *Calystegietalia sepium*, all. *Senecion fluviatilis*, ord. *Galio-Calystegietalia sepium*, all. *Convolvulion sepium*, cl. *Epilobietea angustifolii* ord. *Epilobietalia angustifolii*, all. *Epilobion angustifolii* or within typically ruderal communities (cl. *Artemisietea vulgaris*, ord. *Onopordetalia*, all. *Onopordion, Eu-Arction, Arction lappae*).

The above three groups of orders and association alliances with two classes are and should continue to be reserved only for phytocenoses belonging to a strictly defined biotopic and floristic circle: ruderal or seminatural but not simultaneously ruderal and seminatural. It appears that for the phytocenoses investigated with North-American neophyte species that grow equally frequently among different biotopic and floristic circles, the most appropriate higher phytosociological units would be primarily: cl. *Artemisietea vulgaris* and all. *Alliarion* possibly assigned to ord. *Onopordetalia acanthii*. In all the existing phytosociological systems (52, 59) all. *Alliarion* covers

phytocenoses of a very wide biotopic and floristic circle: from habitats with a seminatural character to weakly and extremely ruderal habitats and communities.

In that case all. *Alliarion* becomes far richer both in new plant communities and in characteristic species, new for the associations and the alliance. This applies mainly to the following plants that make up separate phytocenoses in ruderal and seminatural habitats: *Asclepias syriacea, Aster lanceolatus, A. novae-angliae, A. novi-belgii, A. salicifolia, A. simplex, Collomia grandiflora, Echinocystis lobata, Epilobium adenocaulon, Erigeron annuus, E. strigosus, Helianthus tuberosus, Impatiens glandulifera, Lupinus polyphyllus, Reynoutria japonica, R. sachalinensis, Rudbeckia hirta, R. graminifolia, R. laciniata, Sambucus nigra, Solidago canadensis, S. gigantea, S. graminifolia.*

THE SURVEY OF THE PHYTOCENOSES DISTINGUISHED

In view of the data listed in the foregoing parts the proposed rank and position in the phytosociological system of the distinguished syntaxons with *Rudbeckia laciniata*, with *Solidago canadensis* and *S. gigantea* are as follows:

Cl. *Artemisietea vulgaris* Lohm, Prsg. et Tx. 1950
ord. *Onopordetalia acanthii* Br.-Bl. et Tx. em Görs 1966
all. *Alliarion* Oberd. (1957) 1962
ass. 1. *Rudbeckietum laciniatae* (Kopecký 1974, Fijałk. 1991), nomen et comb. nova
ass. 2. *Solidaginetum canadensis* (Brandes 1981, et al., Fijałk. 1991), nomen et comb. nova
ass. 3. *Solidaginetum giganteae* (Faliński, Falińska 1965, et al., Fijałk. 1991), nomen et comb. nova
subass. 3.1. *S.g. aegopodietosum*, n. subass.
subass. 3.2. *S. g. rubetosum*, n. subass.
Cl. *Querco-Fagetea* Br.-Bl. et Vlieg. 1937
ord. *Fagetalia silvaticae* Pawł. 1928
all. *Carpinion betuli* Oberd. 1953
comm. 4. degraded *Tilio-Carpinetum* with *Solidago gigantea: Tilio-Carpinetum fagetosum* with *Solidago gigantea, Quercus-Solidago gigantea, Pinus-Rubus hirtus* with *Solidago gigantea, Pinus-Rubus hirtus* with *Pteridium aquilinum* and *Solidago gigantea*

Floristic affinity coefficient (Tab. 2). While computing the coefficients of "floristic affinity" of the phytocenoses investigated (60) both the species coming from separate layers: trees and shrubs (A, B), the undergrowth (C) and bryophytes (D), and those coming from all the layers (A–D) were taken into consideration. It was found that coefficient values of

floristic affinity for all the combinations of plant layers are generally high and diversified. It should also be noted that there are quite different possibilities of ranking those phytocenoses in respect of affinity coefficients, when the species coming from separate plant layers: trees and shrubs (A, B), the undergrowth (C) and bryophytes (D) were taken into consideration. The most appropriate, successive ordering of those phytocenoses was obtained with affinity coefficients for the undergrowth species (C).

On the whole, the phytocenoses distinguished with North-American neophyte species can be divided into two distinct groups in respect of the highest floristic affinity coefficients. One very compact group is composed of the associations *Rudbeckietum laciniatae, Solidaginetum canadensis* and *S. gigantea* with two subassociations, while the other group is made up only of the communities of the degraded dry-ground forest with *Solidago gigantea* (Tab. 2).

Permanence and plant cover (Tabs 3 and 4). In all the five distinguished basic and suboridinate phytocenoses there were a total of 452 plant species, including 23 tree species, 29 — shrubs, 358 — herbaceous plants and sub-shrubs, and 42 bryophyte species. One basic phytocenose under investigation contains 93 to 386 plant species from all their layers.

The phytocenoses described have a highly heterogeneous floristic composition. They are primarily characterized by the presence of most frequently single, rarely several species with the highest classes of permanence and cover. There are most frequent and numerous occurrences of plants that at the same time regarded as characteristic species of those phytocenoses. In the phytocenoses currently described they are: *Rudbeckia laciniata, Solidago canadensis* and *S. gigantea.* However, plants with the lowest classes of permanence (r, +) and cover (s, +) are two, three, or four times numerically stronger than plants with somewhat higher constancy and cover classes with 1–3 scale (Tab. 3). There are very few plants that occur with different constance in all examined phytocenoses. This applies most often to generally common synanthropic species like for example *Achillea millefolium, Urtica dioica, Festuca rubra, Rubus caesius, Rubus idaeus, Calamagrostis epigeios, Veronica chamaedrys, Brachythecium velutini.*

Syntaxonomic structure (Tabs 4 and 5). The phytocenoses investigated are very complex in respect of their general syntaxonomic composition. There are species groups characteristic of very different habitats and plant communities, from aquatic to swamp plants to mesophilous, xerophilous and sand plants. The highest syntaxonomic diversity is found in herbaceous plants and subshrubs, and by far lower in trees, shrubs and bryophytes. The basic most numerous syntaxonomic groups are made up of

species characteristic of definite higher units of the classes *Artemisietea vulgaris, Molinio-Arrhenatheretea* and *Polygono-Poëtea annuae*. However, the comparatively highest group values in those phytocenoses are obtained by species characteristic of the classes *Molinio-Arrhenatheretea, Agropyro intermedii-repentis, Artemisietea vulgaris* and *Querco-Fagetea* and of the communities of nitrophilous, semi-natural and ruderal herbaceous plants of the orders and alliances *Galio-Calystegietalia sepium, Convolvuletalia sepium, Senecion fluviatilis* and *Alliarion*.

The existing differences and similarities between the phytocenoses under investigation in respect of the general syntaxonomic composition and their group values are highly complex and difficult to define conclusively. In general, those phytocenoses can be divided into three groups in respect of syntaxonomic structure. The first is made up of the association *Rudbeckietum laciniatae*, the second of the associations *Solidaginetum canadensis* and *S. giganteae* and the third of the associations of the degraded *Tilio-Carpinetum* forest with *Solidago gigantea*.

Chemical properties of soils (Tab. 1). The phytocenoses with three North-American neophyte species are found on various soils weakly and typically anthropogenic (squares, road and railway embankments, fence areas, rubbish heaps (and natural) alluvial, brown and grey-brown soils).

They are mostly fertile soils, but periodically moistened or overdried to a different degree. The soils of those phytocenoses formed on anthropogenic habitats are most often highly alkaline and on average diversified for humus content, for $CaCO_3$, Mg, S, $N\text{-}NH_3^-$ $N\text{-}NH_4^+$, P_2O_5, K_2O compounds, and highly diversified for hydrolytic nitrogen content. In the natural soil, however, examined in the phytocenose of the degraded *Tilio-Carpinetum* forest with *Solidago serotina*, there is total absence of $CaCO_3$ compounds, a very low content of K_2O, strong acidification and a high humus content.

1. *Rudbeckietum laciniatae*

(Fig. 1, Tabs 1–6)

The list of successively described phytocenoses made up of *Rudbeckia laciniata*, including only those authors who first described those phytocenoses thoroughly, is as follows:

ass. *Rudbeckio-Solidaginetum* (Aniol-Kwiatkowska 1974):

comm. with *Rudbeckia laciniata* (Kopecký 1974);

ass. *Aegopodio-Rudbeckietum* Kędzierawska 1984 after Fijałkowski (mss., 1991).

Table 1. The list of published chemical properties of soils after the authors quoted in particular phytocenose expanses: 2. *Solidaginetum canadensis*, 3.1. *Solidaginetum giganteae aegopodietosum*, 3.2. *S.g. rubetosum*, 4. degraded *Tilio-Carpinetum* with *Solidago gigantea*

Authors	Number of community	Number of records	Depth of horizon in cm	Content in % humus	Content in % $CaCO_3$	Content in mg/100g of soil P_2O_5	K_2O	Mg	$N\text{-}NO_3^-$	$N\text{-}NH_4^+$	N hydr.	S	pH in 1n KCl	pH in H_2O dest.
Święs, Urban (1986/88)	2.	42/137	5-20	.	0,03	50,0	10,0	0,6	1,00	0,32	.	0,010	7,2	7,7
Święs (1989)	3.1.	72/281	5-20	3,52	1,69	9,9	6,7	4,2	1,30	.	.	.	7,1	7,7
Kucharczyk H., Kucharczyk M. (1983)	3.1.	91/52	5-20	.	0,75	6,0	16,0	13,4	2,00	0,40	.	0,010	7,4	7,5
Święs, Kucharczyk (1982)	3.1.	98/55	5-20	.	0,41	22,4	29,0	10,0	0,25	1,20	.	0,014	7,0	7,4
Święs, Piórecki (1986)	3.1.	105/142	5-20	1,14	0,18	15,5	6,7	16,4	.	.	8,36	.	7,0	7,8
Święs (1993)	3.1.	114/265	5-20	4,35	0,14	8,0	13,3	19,6	1,90	.	.	.	6,9	7,3
Święs, Witkowska-Wawer (1986)	3.1.	119/369	5-20	4,00	0,58	15,2	24,7	18,8	3,00	.	.	.	7,0	7,8
Święs, Urban (1986)	3.1.	137/141	5-20	.	1,63	33,0	23,6	13,6	0,50	3,00	.	0,630	7,7	7,7
Kępczyńska-Rijken (1977)	3.1.	?	5-20	3,87	1,95	22,0	16,0	8,1	.	.	0,02	.	7,3	7,5
Kępczyńska-Rijken (1977)	3.1.	?	5-20	4,61	1,34	23,0	18,0	16,5	.	.	0,11	.	7,2	7,9
Święs, Kwiatkowska (1995)	3.2.	143/249	5-20	2,49	1,50	27,6	4,8	26,4	1,20	.	.	.	6,8	6,9
Święs (1989)	3.2.	145/283	5-20	3,18	0,04	6,8	8,7	9,6	1,80	.	.	.	6,3	6,9
Święs (1990)	4.	189/188	5-6	12,20	0,00	11,9	2,5	.	.	.	.	.	3,0	.
			20-30	.	0,00	11,9	0,6	.	.	.	.	.	3,5	.
			60-70	.	0,00	21,1	0,3	.	.	.	.	.	3,6	.
			90-100	.	0,00	6,2	0,9	.	.	.	.	.	3,8	.
			150-160	.	0,00	3,4	0,7	.	.	.	.	.	4,1	.

The foregoing data indicate that the main co-authorship in the currently defined association *Rudbeckietum laciniatae* falls primarily to Kopecký (42) and Anioł-Kwiatkowska (1) and then to Kędzierawska (36) after Fijałkowski (mss., 14).

The characteristics of the association *Rudbeckietum laciniatae* was based on 29 phytosociological records that came from the following geobotanical regions (Fig. 1, Tab. 6):

Subdivision: Great Valleys Zone: Great-Poland — Kujawy Region, Poznań — Kujawy district (rec. 22). Podlasie Region, Łuków — Siedlce district (rec. 29). Lublin — Polesie Region (rec. 3, 4, 10, 11, 28).

Subdivision: Piedmont Basins Zone — Silesia Region, Low Silesia Forest district (rec. 24, 25). Sandomierz Region, Oświęcim district (rec. 8, 9, 15–18, 27).

Division: Steppe and Forest — West Volhynia Region (rec. 1, 2, 12, 14).

The above phytosociological records come from two basic kinds of habitats:

— Weakly ruderal: grassy, tree- and shrub-covered edges of wasteland, parks and cemeteries, fence ground, squares adjoining buildings (rec. 1–12, 14–21, 24–26, 28).

— Seminatural: cleared riverside forests, thicket in damp valleys (rec. 8, 9, 13, 22, 23, 27, 29).

The association *Rudbeckietum laciniatae* does not exhibit greater diversification in respect of its phytosociological structure. The most numerous are plant species characteristic of definite higher units of the class *Artemisietea vulgaris* and *Molinio-Arrhenatheretea*. The highest group values are obtained for the characteristic species of the classes *Artemisietea vulgaris* and *Querco-Fagetea*, then of the orders and alliances of ruderal, nitrophilous and herbaceous plants (*Galio-Calystegietalia sepium, Convolvulion sepium, Alliarion*) and various cosmpolitan synanthropic species (Tabs 4, 5). Moreover, sporadic occurrence of plants belonging to trees and shrubs as well as herbaceous (segetal, growing in thicket and on sand) plants should also be noted.

Rudbeckia laciniata grows most often and most massively in that association. At the same time it is the only species characteristic of that association with a very high degree of fidelity. Species characteristic of other associations composed of various North-American neophyte species are found rarely and in small numbers in that association. In the association *Rudbeckietum laciniatae*, apart from *Rudbeckia laciniata*, the comparatively highest, maximum (3–4) classes of constancy can be granted only to: *Aegopodium podagraria, Urtica dioica, Artemisia vulgaris* and *Eurhynchium hians*.

Also, apart from *Rudbeckia laciniata*, the higher, maximum two-grade classes of cover are exhibited by: fairly often — *Urtica dioica, Aegopodium podagraria* and *Arctium tomentosum*, sporadically — *Galium aparine, Impatiens glandulifera, Solidago canadensis, S. gigantea, Aster salicifolia* and *A. lanceolatus*.

2. *Solidaginetum canadensis*

(Fig. 1, Tabs 1–6)

The list of successively described forms of phytocenoses with a dominance of *Solidago canadensis* and including only those authors who were the first to describe those phytocenoses most thoroughly is as follows:

Fac. system of *Solidago canadensis* in the association *Tanaceto-Artemisietum* (Knapp 1945) and in other associations (Hilbig 1972, Oberdorfer 1983);
Comm. with *Solidago canadensis* and *S. gigantea* (Holzner 1972);
ass. *Rudbeckio-Solidaginetum* (Aniol-Kwiatkowska 1974);
ass. *Helianthus-Solidago* (Kępczyńska-Rijken 1977),
ass. *Rubo-Solidaginetum canadensis* (Kędzierawska 1984 after Fijałkowski, mss., 1991).

It follows from this list that the main co-authors for the present association *Solidaginetum canadensis* should be respectively named Brandes (4) and Kędzierawska (36) after Fijałkowski (mss., 14).

The syntaxonomic characteristics of the association *Solidaginetum canadensis* was based on 31 phytosociological records taken from the following geobotanical regions in Poland (Fig. 1, Tab. 6):

Subdivision: Littoral Plains and Pomeranian Upland Zone — Baltic Coastland Region (rec. 44–46, 57).
Subdivision: Great Valleys Zone — Great Poland — Kujawy Region, Poznań — Kujawy district (rec. 54, 56), Lublin — Polesie Region (rec. 39, 40, 50). Podlasie Region, Łuków — Siedlce district (rec. 180–183).
Subdivision: Central Uplands Zone — Lublin Upland Region (rec. 31–34, 36, 38, 51, 184–193).
Subdivision: Piedmont Basins Zone — Silesian Region, Low-Silesian Forests district (rec. 43, 47–49), the Oder district (rec. 59, 60). Sandomierz Region, Oświęcim district (rec. 30, 52, 53, 55, 58), Sandomierz Forest district (rec. 42).
Division: Steppe and Forest — West Volhynia Region (rec. 35, 37, 41).

The phytosociological records of the association *Solidaginetum canadensis* were taken in two basic types of habitats:

Weakly and typically ruderal: shrub-covered and weakly tree-covered rims of gardens, parks, and cemeteries, grassy wasteland and bare, old soil banks (rec. 30, 33–53, 55, 57–60).

Edges of riverside marshy meadows and shrubs of damp valleys (rec. 31, 32, 54, 56).

In the association *Solidaginetum canadensis* the numerically strongest are species characteristic of most of the higher syntaxonomic units of the class *Molinio-Arrhenatheretea* and *Artemisietea vulgaris*. The comparatively highest group values fall in turn to species characteristic of the classes *Molinio-Arrhenatheretea, Agropyro intermedii-repentis, Artemisietea vulgaris, Epilobietea angustifolii* and *Querco-Fagetea* and to the species characteristic of the group of orders and alliances comprising herbaceous, nitrophilous seminatural and ruderal communities (*Galio-Calystegietalia sepium, Convolvulion sepium, Senecion fluviatilis, Alliarion*).

Table 2. Floristic affinity coefficients calculated according to the Kulczyński (60) formula between phytocenoses: 1. *Rudbeckietum laciniatae*, 2. *Solidaginetum canadensis*, 3. *Solidaginetum giganteae*, 3.1. *S.g. aegopodietosum*, 3.2. *S.g. rubetosum*, 4. degraded *Tilio-Carpinetum* with *Solidago gigantea*

A,B

1.	38	30	39	9	7
	2.	19	26	16	3
		3.	68	53	33
			3.2.	51	35
				3.1.	40
					4.

C

1.	54	51	53	39	13
	2.	61	60	44	13
		3.	85	67	23
			3.1.	51	17
				3.2.	32
					4.

D

4.	34	28	10	6	0
	1.	48	23	21	12
		2.	45	36	26
			3.1.	72	16
				3.	48
					3.2.

A–D

1.	53	47	51	34	12
	2.	57	59	40	12
		3.	82	64	22
			3.1.	45	15
				3.2.	31
					4.

Explanation: in plant layers: A, B — trees and shrubs, C — undergrowth, D — bryophytes, A–D — the total of plant layers.

In the *Solidaginetum canadensis* association the highest class of frequency and cover is achieved only by *Solidago canadensis*. This plant is the only species characteristic of the association and with a high degree of fidelity. Out of the species characteristic of other associations of the group of North-American neophytes, *Solidago gigantea, Helianthus tuberosus, Aster novi-belgii* and *A. salicifolia* are found in small numbers. In the association *Solidaginetum canadensis*, apart from the main dominant *Solidago canadensis*, the successive, comparatively highest three-, less often

Table 3. Distribution of constancy classes (a) and classes of mean species cover (b) among layers of trees and shrubs (A, B), undergrowth (C), bryophytes (D) and their total (A–D) in phytocenoses (according to Table 5): 1. *Rudbeckietum laciniatae*, 2. *Solidaginetum canadensis*, 3. *Solidaginetum giganteae*, 3.1. *S.g. aegopodietosum*, 3.2. — *S.g. rubetosum* 4. degraded *Tilio-Carpinetum* with *Solidago gigantea*

Per cent and classes of presence /a/ and cover species /b/		Number of community Layer of phytocenosis 1. A-D	A,B	C	D	2. A-D	A,B	C	D	3. A-D	A,B	C	D	3.1. A-D	A,B	C	D	3.2. A-D	A,B	C	D	4. A-D	A,B	C	D
a.																									
<1;3;7%	s	77	5	63	9	90	13	74	3	151	13	126	12	98	2	92	4	133	16	108	9	27	9	17	1
2,4,8-9	+	23	1	21	1	33	2	28	3	200	25	155	20	112	1	98	13	61	13	41	7	.	.	.	.
10-20	1	36	.	32	4	28	.	26	2	23	2	20	1	23	.	23	.	35	8	25	2	25	6	18	1
21-40	2	9	.	8	1	14	.	14	.	10	.	10	.	13	.	13	.	14	3	11	.	22	4	17	1
41-60	3	1	.	1	.	3	.	3	.	4	.	4	.	2	.	2	.	4	.	4	.	9	3	6	.
61-80	4	2	.	2	.	.	.	.	.	.	.	.	.	3	.	3	.	.	.	.	.	12	4	8	.
81-100	5	1	.	1	.	2	.	2	.	1	.	1	.	1	.	1	.	1	.	1	.	2	1	1	.
b.																									
<0,09%	r	103	4	87	12	110	6	99	5	328	31	268	29	212	3	196	13	175	21	141	13	58	14	44	.
0,1-0,19	+	16	1	14	1	28	4	22	2	26	2	22	2	6	.	4	2	27	5	19	3	1	.	1	.
0,2-5,0	1	28	1	25	2	31	5	25	1	34	7	25	2	32	.	30	2	44	14	28	2	25	7	15	3
5,1-17,5	2	1	.	1	.	.	.	.	.	.	.	.	.	1	.	1	.	1	.	1	.	9	4	5	.
17,6-37,5	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	1	.
37,6-62,5	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.
62,5-87,5	5	1	.	1	.	1	.	1	.	1	.	1	.	1	.	1	.	1	.	1	.	1	.	1	.
Total		149	6	128	15	170	15	147	8	389	40	316	33	252	3	232	17	248	40	190	18	97	27	67	3

four-grade classes of constancy are assigned to *Artemisia vulgaris*, *Urtica dioica*, *Achillea millefolium* and *Elymus repens*. Besides *Solidago canadensis*, the higher, maximum two-three grades of cover are exhibited by: fairly often *Urtica dioica*, *Artemisia vulgaris* and *Aegopodium podagraria*, rarely or sporadically — by *Tanacetum vulgare*, *Rubus caesius*, *Calystegia sepium*, *Solidago gigantea* and *Helianthus tuberosus*.

3. *Solidaginetum giganteae*

(Fig. 1, Tabs 1–6)

The list of the described phytocenoses characterized by the distinct domination of *Solidago gigantea*, including only those authors who first defined those phytocenoses most accurately, is as follows:

comm. with *Chaerophyllum aromaticum* and *Solidago gigantea* (Faliński, Falińska 1965);

comm. with *Solidago gigantea* (Görs, Müller 1969);

fac. (facial system with *Solidago gigantea* in the ass. *Tanaceto-Artemisietum* (Rostański, Gutte 1971) and in other associations (Görs 1974, Görs, Müller 1969);

comm. with *Solidago gigantea* and *S. canadensis* (Moltzner 1972);

ass. *Rudbeckio-Solidaginetum* (Anioł-Kwiatkowska 1974);

ass. *Rubo-Solidaginetum serotinae* (Fijałkowski 1978).

The list above shows that the main co-authors of the present characterization of the association *Solidaginetum giganteae* are Faliński, Falińska (11) and Fijałkowski (14).

The syntaxonomic characteristic of the association *Solidaginetum giganteae* was based on 120 phytosociological records that come from the following geobotanical regions in Poland (Fig. 1, Tab. 6):

Subdivision: Littoral Plains and Pomeranian Uplands Zone — Baltic coastland Region (subass. 3.1, rec. 61, 62, 66, 68, 81, 94). Pomeranian Coastland Region, Olsztyn district (subass. 3.1. rec. 84, 99, 100), Iława district (subass. 3.1. rec. 80, 117, 126, subass. 3.2, rec. 168).

Subdivision: Great Valleys Zone — Great-Poland — Kujawy Region, Poznań — Kujawy district (subass. 3.1, rec. 88, 120, 123, 125; subass. 3.2, rec. 146, 149, 167), the Barycza district (subass. 3.1, rec. 120). Mazovian Region, Warsaw district (subass. 3.1, rec. 70, 71, 73, 78, 86, 111, 136; subass. 3.2, rec. 144). Podlasie Region, Łuków — Siedlce district (subass. 3.1, rec. 74, 85, 102, subass. 3.2, rec. 141–143, 147, 148, 152, 153, 159, 160). Lublin Polesie Region (subass. 3.1, rec. 139, 140, 154, 165; subass. 3.2. rec. 150, 177–179).

Subdivision: Central Uplands Zone — Lublin Upland Region (Subass. 3.1, rec. 124, 132, 164, 169; subass. 3.2, rec. 155–158, 163, 170–176).

Subdivision: Piedmont Basins Zone — Silesia Region, the Oder district (subass. 3.1, rec. 63–65, 87, 93, 131; subass. 3.2, rec. 151, 161, 162). Sandomierz Region, Oświęcim district (subass. 3.1, rec. 67, 69, 96, 122, 127, 128, 133), Sandomierz Forest

Tab. 4. Skład florystyczny zespołów z klasy *Festuco-Brometea*

Floristic composition of associations from the class *Festuco-Brometea*

Nr zespołu / No. of association	6									7															
Nr zdjęcia / No. of record	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Zwarcie warstwy drzew a w % / Cover of tree-layer a in %																					10												
Zwarcie warstwy krzewów b w % / Cover of shrub-layer b in %							+														10			20	10								
Pokrycie warstwy runa c w % / Cover of herb-layer c in %	100	100	100	100	100	100	100	100	100	100	90	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Pokrycie warstwy mchów d w % / Cover of moss-layer d in %																	10												10				
1. Thalictro-Salvietum pratensis:																																	
Thalictrum minus	3	.	+	1	4	5	6	3	3	1	1	.	+	.	+	.	+	+	+	1	.	.	.	.	.	.	+	+	1	1	.	.	.
Salvia pratensis	2	4	4	2	+	+	1	.	+	+	.	.	+	+	+	+	+	.	+	1	1	.	+	+	1	+	+	+	.	+	.	.	.
Campanula bononiensis	+	.	2	.	+	.	.	+	1	5	2	.	1	+	+	+	+	+	.	+	.	.	.	.	+	+	.	+	.	+	.	.	1
Agropyron intermedium	4	.	+	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	4	.	.	+
Carex praecox	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2. Origano-Brachypodietum:																																	
Brachypodium pinnatum	+	.	.	+	1	.	+	+	.	.	.	1	3	5	5	8	8	7	7	5	6	5	6	6	4	4	2	2	.	.	.	.	.
Agrimonia eupatoria	+	.	+	.	.	+	+	.	+	+	.	.	+	+	.	.	+	+	+	.	+	+	+	+	.	+	+	.	.	.	+	+	.
Origanum vulgare	.	.	.	.	2	+	.	.	+	+	.	4	3	2	2	1	+	+	+	.	.	.	.	.	.	.	+	.	+	.	+	.	.
Hypericum perforatum	.	.	.	+	+	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
3. Ciraio-Brachypodion pinnati:																																	
Seseli annuum	.	.	.	+	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Veronica austriaca	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Aster amellus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
4. Festucetalia valesiacae:																																	
Potentilla arenaria	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+
Phleum phleoides	+	.	+	.	+	+	+	.	.	+	.	+	.	+	.	+	.	.	.	+	.	+	+	1	+	.	+	.	.	+	.	.	.
Scabiosa ochroleuca	+	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.
Verbascum phoeniceum	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	+	.	.	+	.	.	+
Achillea pannonica	.	.	.	+	+	+	.	.	.	.	.	+	.	.	.	.	+	.	+	.	.	.	.	+	.	.	+	.	.	+	+	+	.
Bromus inermis	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Asparagus officinalis	.	.	.	.	.	+	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.
Achillea collina	.	.	.	.	.	.	.	.	.	.	r	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Thesium linophyllon	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Anthemis tinctoria	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Salvia verticillata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca sulcata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Hieracium bauhinii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.
Campanula sibirica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Koeleria macrantha	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
5. Festuco-Brometea:																																	
Artemisia campestris	.	+	+	+	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	+	+	+
Euphorbia cyparissias	+	.	+	.	+	.	+	.	.	+	.	+	.	+	.	+	.	+	.	+	.	+	.	.	+	.	.	+	.	+	+	+	+
Centaurea scabiosa	+	.	.	+	+	.	.	1	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Poa compressa	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	5
Allium oleraceum	.	.	+	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	4
Aoinos arvensis	.	.	+	.	.	.	+	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stachys recta	.	.	2	+	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	1	.	.	.	.	4	+	+	+	.	.	.	.
Filipendula vulgaris	.	.	.	+	.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	+	.	.	+	.	+	.	.	.	.	3	.	+	.
Dianthus carthusianorum	.	.	.	1	.	.	1	.	.	.	.	.	.	+	+	+	.	.	.	r	.	2	1	1	.	.	.	.	.	+	.	.	.
Veronica spicata ssp. spicata	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	+	1
Galium mollugo	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	+	.
Plantago media	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla heptaphylla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6. Trifolio-Geranietea																																	
Galium verum	+	+	2	2	1	+	1	2	.	+	2	.	2	1	1	.	.	.	.	2	+	1	1	1	1	+	.	+	+	+	2	+	+
Medicago falcata	1	.	+	+	1	+	1	.	4	1	2	.	+	.	+	+	+	.	1	+	3	3	2	2	+	.	2	+	+	r	+	+	.
Coronilla varia	.	+	+	+	.	.	.	.	.	.	.	.	.	+	.	+	+	.	+	1	.	.	.	.	.	+	.	.	.	+	.	.	.
Clinopodium vulgare	.	.	.	.	.	+	.	.	.	+	.	+	.	+	.	+	.	+	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.
Orobanche alsatica	r	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Peucedanum cervaria	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Astragalus glycyphyllos	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Anemone sylvestris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fragaria viridis	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium alpestre	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia dumetorum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium medium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Geranium sanguineum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.
7. Molinio-Arrhenatheretea:																																	
Achillea millefolium	+	+	+	+	+	+	+	+	+	+	1	+	+	.	.	.	.	+	+	+	+	+	+	+	+	+	.	+	.	.	+	+	
Festuca rubra	+	1	.	+	.	+	+	.	+	+	.	+	+	.	.	1	.	.	.	.	+	.	.	+	.	.	+	.	.	.	2	.	+
Veronica chamaedrys	+	.	.	.	+	+	.	+	+	+	.	+	+	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	+	.	.
Knautia arvensis	+	.	+	+	.	+	.	+	.	+	+	+	+	.	.	.	+	.	.	.	+	+	.	.	+	.	.	.	.	.	+	+	+
Daucus carota	.	+	.	.	.	.	.	.	+	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Lotus corniculatus	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Poa pratensis	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Vicia cracca	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	1	+	+	.	.	.	.	.	+	.	.	.	.	.	+	.	.
Tragopogon pratensis	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dactylis glomerata	.	.	.	+	.	.	.	+	+	+	+	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca pratensis	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium pratense	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Arrhenatherum elatius	.	.	.	.	3	.	.	3	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Carum carvi	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plantago lanceolata	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Trifolium repens	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Taraxacum officinale	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Trifolium montanum	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	r	.	.	r	.	.	.	.	.	.	.	.	.	.	.
Pimpinella maior	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+
Anthriscus sylvestris	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rumex acetosa	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geranium pratense	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Campanula patula ssp. patula	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Deschampsia caespitosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.
Anthyllis vulneraria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Phleum pratense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
8. Towarzyszące - Accompanying:																																	
Prunus spinosa b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Prunus spinosa c	.	.	+	+	.	.	x	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	.	.	.	.	.
Berberis vulgaris b	.	.	.	.	.	+	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Berberis vulgaris c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rosa canina b	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.
Populus tremula b	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Populus tremula c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Quercus robur c	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Rhamnus catharticus b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Betula pendula a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Betula pendula b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Crataegus monogyna b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	+	.	.	.	.	.	.	.	.	x	.	.	.	.	.
Crataegus monogyna c	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Corylus avellana b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.
Corylus avellana c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Rosa sp. b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+
Pyrus communis b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Pyrus communis c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pinus sylvestris a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.
Prunus fruticosa b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	x	.	.	.	.
Artemisia vulgaris	+	.	+	+	.	+	.	+	1	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	1	.
Convolvulus arvensis	+	.	.	.	+	+	+	+	.	+	+	+	+	+	+	.	.	.	.	.	+	.	+	+	.	.	.	.	+	r	+	.	+
Thymus pulegioides	+	+	.	+	+	.	+	.	+	.	.	+	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	+	.	+
Vincetoxicum hirundinaria	+	.	.	.	+	+	.	.	+	r	.	.	.	.	2	+	+	2	.	.	+	.	.	.	.	2	+	7	8	5	.	.	.
Pimpinella saxifraga	.	.	+	+	+	+	+	.	.	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Carex spicata	+	.	.	.	+	+	.	.	.	+	3	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.
Carex hirta	+	.	.	.	.	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.
Elymus repens	+	.	.	.	.	r	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	.	+
Berteroa incana	+	1	.	+	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	+	.	1
Centaurea rhenana	.	2	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	+
Lavathera thuringiaca	.	.	+	+	.	.	.	+	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Eryngium planum	.	.	+	.	.	.	+	+	+	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+
Rubus caesius	.	.	+	+	.	.	.	+	.	.	.	.	.	.	+	+	+	+	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.
Sedum telephium ssp. maximum	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Malva alcea	.	.	2	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Equisetum arvense	.	+	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Hieracium pilosella	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Agrostis tenuis	.	1	.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+
Cirsium arvense	.	.	+	.	.	.	.	.	.	.	.	r	.	.	.	.	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.
Medicago lupulina	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Prunella vulgaris	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium arvense	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Potentilla argentea	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Linaria vulgaris	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Bilderdykia convolvulus	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	r	.	.	.
Solidago gigantea	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Verbascum nigrum	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Urtica dioica	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	+	.	.	.	.	.	.	.	.
Falcaria vulgaris	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Lolium perenne	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Silene alba	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Peucedanum oreoselinum	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Buglossoides arvensis	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Vicia hirsuta	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Viola canina	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hieracium sabaudum	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Epilobium montanum	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Vicia angustifolia	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Stellaria graminea	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Centaurium erythraea ssp. erythraea	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Potentilla reptans	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Chamaecytisus ratisbonensis	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+
Briza media	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anthoxanthum odoratum	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Lithospermum officinale	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Calamagrostis epigeios	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.
Stachys officinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Cimicifuga europaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.
Cichorium intybus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+

Gatunki sporadyczne /Sporadic species/:

8. Glechoma hederacea 51/+, Danthonia decumbens 51/+, Viola hirta 54/+, Campanula trachelium 55/+, Carex muricata ssp. pairaei 55/+, Fragaria moschata55/r, Anagallis arvensis 59/r, Erigeron canadensis 62/r, Oxalis stricta 62/+, Plantago maior 62/r, Myosotis arvensis 64/r, Prunus cerasus b 68/+, Euonymus europaeus b 68/+, Euonymus verrucosus b 68/+, Parthenocissus quinquefolia 68/+, Carduus acanthoides 75/r, Genista tinctoria 76/2, Fragaria vesca 76/+, Sorbus aucuparia c 76/+, Atrichum undulatum d 76/+, Thuidium abietinum d 76/+, Verbena officinalis 77/r, Rubus plicatus 78/+, Solidago virgaurea 78/+, Euphrasia stricta 81/+, Senecio jacobea 81/+, Sedum acre 83/+, Ononis arvensis 83/+.

Table 4 continued

1	2	3	4	5
g Aster salicifolia (Ch:Ca)	4 3 1 1 . .	1 1 s s . .	22,7 5,2 0,1 0,1 . .	1 + r r . .
g Rudbeckia laciniata	29 4 2 1 1 .	5 1 + s s .	1917,5 92,6 0,2 0,1 0,1 .	5 1 r r r .
g Saponaria officinalis	5 1 4 3 1 .	1 s + + s .	0,5 1,1 0,4 0,3 0,1 .	r r r r r .
g Solidago gigantea	3 7 119 80 39 14	1 2 5 5 5 5	22,6 75,1 8322,6 5857,5 2465,1 955,0	1 1 5 5 5 5
g Senecio fluviatilis (Ch:Cs) ..	. 1 1 1 . .	. s s s . .	. 5,0 0,1 0,1 . .	. + r r . .
g Rudbeckia hirta	. . 2 2 . .	. . + + . .	. . 35,0 35,0 . .	. . 1 1 . .
g Cuscuta europaea	. . 2 1 1 .	. . + s s .	. . 5,1 5,0 0,1 .	. . r r r .
h Galeopsis speciosa	3 1	1 s	0,3 0,1	r r . . . .
h Lamium maculatum	1 2 2 2 . .	s + + + . .	0,1 0,2 0,2 0,2 . .	r r r r . .
h Bilderdykia convolvulus	2 3 5 5 . .	+ 1 + + . .	0,2 0,3 0,5 0,5 . .	r r r r . .
h Lapsana communis	2 1 1 1 . .	+ s s s . .	0,2 0,1 0,1 0,1 . .	r r r r . .
h Stellaria media	1 1 1 1 . .	s s s s . .	0,1 5,0 0,1 0,1 . .	r + r r . .
h Stellaria neglecta	1 . 1 1 . .	s . s s . .	0,1 . 0,1 0,1 . .	r . r r . .
h Bilderdykia dumetorum (Ch:Cs)	3 1 2 1 1 .	1 s + s s .	5,2 0,1 0,2 0,1 0,1 .	+ r r r r .
h Galium aparine (Ch:G-Cs)	7 4 26 22 4 .	2 1 2 2 1 .	27,9 0,4 73,9 58,8 15,1 .	1 r 1 1 1 .
h Erigeron annuus	1 2 14 10 4 .	s + 1 1 1 .	5,0 0,2 11,2 5,9 5,3 .	+ r r r + .
h Polygonum amphib. v.terrestre	1 1 1 . 1 .	s s s . s .	5,0 0,1 5,0 . 5,0 .	+ r r . + .
h Lupinus polyphyllos	2 2 2 . 2 .	+ + + . + .	5,1 5,1 5,1 . 5,1 .	+ + r . + .
h Prunella vulgaris	1 . 2 1 1 .	s . + s s .	0,1 . 0,2 0,1 0,1 .	r . r r r .
h Amaranthus retroflexus	2 . 2 . 2 .	+ . + . + .	0,2 . 0,2 . 0,2 .	r . r . r .
h Festuca rubra	4 5 22 11 11 3	1 1 1 1 2 2	0,4 5,4 78,9 28,3 50,6 5,2	r + 1 1 1 1
h Sinapis arvensis	. 1 2 2 . .	. s + + . .	. 0,1 0,2 0,2 . .	. r r r . .
h Galeopsis tetrahit	. 3 4 4 . .	. 1 + + . .	. 0,3 0,4 0,4 . .	. r r r . .
h Senecio vulgaris	. 1 1 1 . .	. s s s . .	. 0,1 0,1 0,1 . .	. r r r . .
h Medicago lupulina	. 1 3 2 1 .	. s + + s .	. 0,1 0,3 0,2 0,1 .	. r r r r .
h Conyza canadensis	. 2 13 10 3 .	. + 1 1 + .	. 0,2 11,1 10,8 0,3 .	. r r + r .
h Agrostis tenuis	. 3 13 2 11 1	. 1 1 + 2 s	. 15,0 33,4 0,2 33,2 17,5	. 1 1 r 1 1
h Galeopsis pubescens	. 3 5 1 4 5	. 1 + s 1 2	. 0,3 15,2 0,1 15,1 10,3	. r + r 1 1
h Medicago sativa	. . 3 3 . .	. . + + . .	. . 0,3 0,3 . .	. . r r . .
h Trifolium hybridum	. . 2 2 . .	. . + + . .	. . 0,2 0,2 . .	. . r r . .
h Lathyrus tuberosus	. . 3 3 . .	. . + + . .	. . 17,7 17,7 . .	. . + 1 . .
h Vicia grandiflora	. . 3 3 . .	. . + + . .	. . 0,3 0,3 . .	. . r r . .
h Mentha arvensis	. . 3 3 . .	. . + + . .	. . 0,3 0,3 . .	. . r r . .
h Parthenocissus quinquefolia ..	. . 2 1 1 .	. . + s s .	. . 17,6 17,5 0,1 .	. . + 1 r .
h Linaria vulgaris	. . 3 2 1 .	. . + s s .	. . 0,2 0,2 0,2 .	. . r r r .
h Anthoxanthum odoratum	. . 2 1 1 .	. . + + s .	. . 0,2 0,1 0,1 .	. . r r r .
h Hypericum perforatum	. . 19 7 12 1	. . 1 + 2 s	. . 11,7 0,7 11,0 0,1	. . + r 1 r
VII. Ch: a (Cl, total) - Sedo-Scleranthetea, b (Cl, total) - Festuco-Brometea				
a Rumex acetosella	. 1 3 2 1 .	. s + + s .	. 0,1 5,2 0,2 5,0 .	. r r r + .
a Trifolium arvense	. . 2 1 1 .	. . + s s .	. . 0,2 0,1 0,1 .	. . r r r .
a Potentilla argentea	. . 2 1 1 .	. . + s s .	. . 0,2 0,1 0,1 .	. . r r r .
a Festuca ovina	. . 2 . 2 .	. . + . + .	. . 0,2 . 0,2 .	. . r . r .
b Asparagus officinalis	1 6 1 1 . .	s 2 s s . .	0,1 0,6 0,1 0,1 . .	r r r r . .
b Bromus inermis	2 1 4 3 1 .	+ s + + s .	0,2 5,0 0,4 0,3 0,1 .	r + r r r .
b Galium mollugo	1 1 13 12 1 1	s s 1 1 s s	0,1 10,0 1,3 1,2 0,1 5,0	r r r r r 1
b Centaurea scabiosa	. 1 1 1 . .	. s s s . .	. 0,5 0,1 0,1 . .	. 1 r r . .
b Artemisia campestris	. . 11 7 4 .	. . + + 1 .	. . 23,4 5,6 17,8 .	. . 1 r 1 .
b Euphorbia cyparissias	. . 4 3 1 .	. . + + s .	. . 0,4 0,3 0,1 .	. . r r r .
b Centaurea rhenana	. . 2 1 1 .	. . + s s .	. . 0,2 0,1 0,1 .	. . r r r .
VIII. Ch: a (Cl, total) - Epilobietea angustifolii, b (Cl, total) - Trifolio-Geranietea sanguinei, c (Cl, total) - Rhamno-Prunetea, d (Xz) - other species of scrub				
a Rubus caesius (Ch:G-Cs)	11 10 52 34 18 1	2 2 3 3 3 s	68,0 28,2 472,4 299,3 173,1 5,0	1 1 1 1 1 1
a Rubus idaeus	1 2 11 3 8 2	s + + + 1 1	0,1 0,2 217,8 5,2 212,6 0,2	r r 1 r 2 r
a Fragaria vesca	1 2 11 2 9 10	s + + + 2 4	5,0 17,6 10,9 0,2 10,7 68,3	+ 1 r r 1 1
a Torilis japonica	. 2 10 6 4 .	. + + + 1 .	. 5,1 1,0 0,6 0,4 .	. r r r r .
a Calamagrostis epigeios	. 5 23 10 13 1	. 1 1 1 2 s	. 0,5 83,4 30,4 53,0 0,1	. r 1 1 1 r
a Rubus sp.	. . 2 2 . .	. . + + . .	. . 17,6 17,6 . .	. . + 1 . .
a Omalotheca sylvatica	. . 6 . 6 .	. . + . 1 .	. . 0,6 . 0,6 .	. . r . r .
a Epilobium angustifolium	. . 3 . 3 .	. . + . + .	. . 5,2 . 5,2 .	. . r . r .
a Cytisus scoparius	. . 2 . 2 .	. . + . + .	. . 0,2 . 0,2 .	. . r . r .
a Senecio sylvaticus	. . 2 . 2 .	. . + . + .	. . 0,2 . 0,2 .	. . r . r .
a Rubus plicatus	. . 2 . 2 7	. . + . + 3	. . 17,6 . 17,6 50,0	. . + . 1 1
b Galium mollugo	. 2	. + ...	. 0,2	. r . . . .
b Coronilla varia	. 1 2 1 1 .	. s + s s .	. 0,1 0,2 0,1 0,1 .	. r r r r .
b Trifolium medium	. . 2 1 1 .	. . + s s .	. . 0,2 0,1 0,1 .	. . r r r .
b Clinopodium vulgare	. . 10 . 10 3	. . + . 2 2	. . 10,8 . 10,8 0,3	. . r . 1 r
b Astragalus glycyphyllos	. . 1 1 . 1	. . s s . s	. . 0,1 . 0,1 .	. . r r . r
c Rubus nessensis	. . 3 1 2 .	. . + s + .	. . 17,7 0,1 17,6 .	. . + r 1 .
d Picris hieracioides	1 . 6 6 . .	s . + + . .	0,1 . 0,6 0,6 . .	r . r r . .
d Pimpinella saxifraga	4 10 6 2 4 .	1 2 + + 1 .	0,4 5,9 0,6 0,2 0,4 .	r 1 r r r .
d Glechoma hederacea (Ch:G-Cs)	2 5 20 17 3 .	+ 1 1 2 + .	5,1 5,4 113,8 98,8 15,0 .	+ + 1 1 1 .
d Vinca minor	2 1 2 . 2 .	+ s + . + .	22,5 0,1 5,1 . 5,1 .	1 r r . + .
d Veronica chamaedrys	1 6 21 9 12 4	s 1 1 1 2 2	0,1 0,6 11,9 0,9 11,0 0,4	r r + r 1 r
d Cichorium intybus	. 3 8 7 1 .	. + + + s .	. 0,3 0,8 0,7 0,1 .	. r r r r .
d Ononis arvensis	. 1 1 1 . .	. s s s . .	. 0,1 0,1 0,1 . .	. r r r . .
d Cuscuta lupuliformis	. . 4 1 3 .	. . + s + .	. . 5,3 0,1 5,2 .	. . r r + .
d Vicia sepium	. . 3 2 1 .	. . + + s .	. . 0,3 0,2 0,1 .	. . r r r .
d Poa angustifolia	. . 2 . 2 .	. . + . + .	. . 0,2 . 0,2 .	. . r . r .
d Equisetum pratense	. . 3 2 1 1	. . + + s s	. . 0,3 0,2 0,1 0,1	. . r r r r
d Cruciata glabra	. . 6 1 5 10	. . + s 1 4	. . 0,6 0,1 0,5 5,9	. . r r 1 1
d Chamaecytisus ratisbonensis ..	. . 1 . 1 2	. . s . s 1	. . 0,1 . 0,1 0,2	. . r . r r
d Genista tinctoria	. . 1 . 1 1	. . s . s s	. . 0,1 . 0,1 0,1	. . r . r r
IX. a (Cl) - Querco-Fagetea, b (O) - Fagetalia silvaticae, c (Al) - Alno-Padion, d (Al) - Carpinion betuli, e (Al) - Fagion silvaticae, f (Cl, total) - Quercetea robori-petraeae (ss), g (Cl) - Vaccinio-Piceetea, h (Xl) - other forest species				
a Aegopodium podagraria	19 11 27 24 3 .	4 2 2 2 + .	108,0 55,6 84,3 84,0 0,3 .	1 1 1 1 r .
a Ranunculus auricomus	1 . 1 . 1 .	s . s . s .	0,1 . 0,1 . 0,1 .	r . r . r .
a Poa nemoralis	1 2 4 3 1 2	s + + + s 1	0,1 5,1 5,3 5,2 0,1 0,2	r + r r r r
a Carex digitata	. . 2 . 2 4	. . + . + 2	. . 0,2 . 0,2 17,8	. . r . r 1
a Anemone nemorosa	. . 3 . 3 9	. . + . + 4	. . 0,3 . 0,3 212,5	. . r . r 2
a Melica nutans	 9	 4	 0,9	. . . . . r
a Viola mirabilis	 2	 1	 0,2	. . . . . r
b Epilobium montanum	1 2 6 . 6 .	s + + . 1 .	0,1 0,2 0,6 . 0,6 .	r r r . r .
b Scrophularia nodosa	1 . 6 4 2 3	s . + + + 2	0,1 . 0,6 0,4 0,2 0,3	r . r r r r
b Asarum europaeum	. . 3 1 2 2	. . + s + 1	. . 0,3 0,1 0,2 22,5	. . r r r 1
b Viola reichenbachiana	. . 7 . 7 4	. . + . 1 2	. . 10,5 . 10,5 0,4	. . r . 1 r
b Pulmonaria obscura	. . 2 . 2 3	. . + . + 2	. . 0,2 . 0,2 5,2	. . r . r 1
b Dryopteris filix-mas	. . 1 . 1 4	. . s . s 2	. . 0,1 . 0,1 0,4	. . r . r r
b Asperula odorata	 8	 3	 227,6	 2
b Milium effusum	 4	 2	 0,4	. . . . . r
b Sanicula europaea	 3	 2	 17,7	 1
c Elymus caninus	. . 2 2 . .	. . + + . .	. . 5,1 5,1 . .	. . r r . .
d Stellaria holostea	4 . 1 . 1 .	1 . s . s .	10,2 . 17,5 . 17,5 .	1 . + . 1 .
e Rubus hirtus	 10	 4	 350,1	 3
g Trientalis europaea	. . 1 . 1 4	. . s . s 2	. . 0,1 . 0,1 0,4	. . r . r r
g Vaccinium myrtillus	. . 1 . 1 4	. . s . s 2	. . 0,1 . 0,1 0,4	. . r . r r
g Orthilia secunda	 2	 1	 0,2	. . . . . r
h Senecio nemorensis	2	+	0,2	r . . . . .
h Humulus lupulus (Ch:G-Cs)	3 1 4 4 . .	1 s + + . .	0,3 5,0 27,6 27,6 . .	r + 1 1 . .
h Equisetum sylvaticum	1 . 1 1 . .	s . s s . .	0,1 . 0,1 0,1 . .	r . r r . .
h Convallaria majalis	1 1 4 . 4 .	s s + . 1 .	5,0 0,1 0,4 . 0,4 .	+ r r . r .
h Geum urbanum (Ch:G-Cs)	3 . 7 4 3 2	1 . + + + 1	0,3 . 15,4 10,2 5,2 0,2	r . + + + r
h Pteridium aquilinum	. . 2 1 1 4	. . + s s 2	. . 0,2 0,1 0,1 110,1	. . r r r 2
h Calamagrostis arundinacea	. . 2 2 . 1	. . + + . s	. . 5,1 5,1 . 0,1	. . r r . r
h Mycelis muralis	. . 1 . 1 2	. . s . s 1	. . 0,1 . 0,1 0,2	. . r . r r
h Hieracium sabaudum	. . 1 . 1 2	. . s . s 1	. . 0,1 . 0,1 0,2	. . r . r r
h Athyrium filix-femina	. . 2 . 2 7	. . + . + 3	. . 0,2 . 0,2 5,6	. . r . r 1
h Majanthemum bifolium	. . 1 . 1 9	. . s . s 4	. . 0,1 . 0,1 10,7	. . r . r 1
h Veronica officinalis	. . 4 . 4 2	. . + . 1 1	. . 0,4 . 0,4 0,2	. . r . r r
h Dryopteris carthusiana	. . 5 . 5 4	. . + . 1 2	. . 0,5 . 0,5 0,4	. . r . r r
h Rubus saxatilis	. . 3 . 3 1	. . + . + s	. . 0,3 . 0,3 0,1	. . r . r r
h Moehringia trinervia	. . 2 . 2 8	. . + . + 3	. . 0,2 . 0,2 0,8	. . r . r r
h Viola riviniana	. . 1 . 1 9	. . s . s 4	. . 0,1 . 0,1 0,9	. . r . r r
h Oxalis acetosella	. . 2 . 2 11	. . + . + 4	. . 5,1 . 5,1 100,1	. . r . + 2
h Ajuga reptans	 5	 2	 0,5	. . . . . r
h Hieracium vulgatum	 2	 1	 0,2	. . . . . r
h Hieracium murorum	 2	 1	 0,2	. . . . . r
h Luzula pilosa	 7	 3	 0,7	. . . . . r
h Pyrola media	 2	 1	 0,2	. . . . . r
D. Mosses and algae				
I. a (Cl, total) - Polygono-Poëtea annuae, b (Cl, total) - Sedo-Scleranthetea				
a Bryum caespiticium	1 . 2 2 . .	s . + + . .	0,1 . 0,2 0,2 . .	r . r r . .
a Bryum argenteum	. . 2 2 . .	. . + + . .	. . 62,6 62,6 . .	. . 1 1 . .
a Funaria hygrometrica	. . 2 2 . .	. . + + . .	. . 0,2 0,2 . .	. . r r . .
b Ceratodon purpureus	. 2 12 7 5 .	. + 1 + 1 .	. 0,2 25,7 15,4 10,3 .	. r 1 + 1 .
b Brachythecium albicans	. . 2 . 2 .	. . + . + .	. . 0,2 . 0,2 .	. . r . r .
II. a (O) - Fagetalia silvaticae (ss), b (Xl) - other forest and all species				
b Anthoceros sp.	3	1	0,3	r . . . . .
b Anthoceros punctatus	1 1	s s	0,1 0,1	r r . . . .
b Grimmia apocarpa	1 1	s s	0,1 0,1	r r . . . .
b Barbula convoluta	1 1	s s	0,1 0,1	r r . . . .
b Eurhynchium hians	6 2 6 6 . .	2 + + + . .	25,1 5,1 5,5 5,5 . .	1 + r r . .
b Plagiomnium elatum	4 . 1 1 . .	1 . s s . .	5,3 . 0,1 0,1 . .	+ . r r . .
b Brachythecium rutabulum	1 2 6 5 1 .	s + + + s .	0,1 10,0 10,4 10,3 0,1 .	r 1 r + r .
b Aloina rigida	1 3 3 . 3 .	s 1 + . + .	0,1 0,3 22,6 . 22,6 .	r r r . 1 .
b Fissidens taxifolius	2 . 1 . 1 .	+ . s . s .	0,2 . 0,1 . 0,1 .	r . r . r .
b Chlorophytum sp.	5 . 2 . 2 .	1 . + . + .	0,5 . 0,2 . 0,2 .	r . r . r .
b Brachythecium salebrosum	5 4 4 4 . 3	1 1 + + . 2	22,8 5,3 22,7 22,7 . 5,2	1 + + 1 . 1
b Plagiomnium undulatum	1 1	b . . . . s	0,1 17,5	r 1
b Amblystegium serpens	. . 4 4 . .	. . + + . .	. . 0,4 0,4 . .	. . r r . .
b Barbula unguiculata	. . 4 4 . .	. . + + . .	. . 0,4 0,4 . .	. . r r . .
b Eurhynchium praelongum	. . 3 3 . .	. . + + . .	. . 0,3 0,3 . .	. . r r . .
b Mnium seligeri	. . 2 2 . .	. . + + . .	. . 0,2 0,2 . .	. . r r . .
b Phascum cuspidatum	. . 2 2 . .	. . + + . .	. . 0,2 0,2 . .	. . r r . .
b Archidium alternifolium	. . 2 2 . .	. . + + . .	. . 0,2 0,2 . .	. . r r . .
b Polytrichum attenuatum	. . 5 . 5 .	. . + . 1 .	. . 5,4 . 5,4 .	. . r . + .
b Polytrichum juniperinum	. . 3 . 3 .	. . + + + .	. . 0,3 . 0,3 .	. . r . + .
b Mnium cuspidatum	. . 3 . 3 .	. . + + + .	. . 0,3 . 0,3 .	. . r . r .
b Catharinea undulata	. . 2 . 2 .	. . + . + .	. . 5,1 . 5,1 .	. . r . r .
b Pottia truncatula	. . 2 . 2 .	. . + . + .	. . 0,2 . 0,2 .	. . r . + .
b Pleurozium schreberi	 2	 1	 17,6	 1

Sporadic species:

A, B. Trees and shrubs: Ib: 2. Ligustrum vulgare b (1); Lonicera tatarica b (1); Rhus typhina b (3); 3,3.2. Philadelphus coronarius b (+); 3,3.2. Prunus serotina b (+). Ic: 4. Sambucus racemosa b/c (+). Id: 2. Clematis vitalba b (2), Euonymus europaea b (+), Berberis vulgaris b (+). IIb: 2. Salix triandra b/c (+); 3,3.2. Populus alba b/c (+); 3,3.2. Salix purpurea b (+). IIc: 4. Fraxinus excelsior b (+); IIe: 3,3.2. Ribes spicatum b (+), IIIa: 2. Ulmus laevis b/c (+); 3,3.2. Quercus petraea b (+); 4. Juniperus communis c (+).

C. Herbaceous plants: Ia: 1. Carex acuta +; 2. Galium palustre +; 3,3.1. Glyceria maxima +, Scrophularia umbrosa +. Ib: 3,3.2. Polygonum lapathifolium +. Ic: 3,3.1. Lycopus europaeus +. Id: 1. Epilobium tetragonum +; 3,3.1. E. obscurum +; Euphorbia lucida 2; 3,3.2. Achillea cartilaginea +; Inula britannica +; 4. Carex ovalis +. IIa: 3,3.2. Calluna vulgaris +; Carex pilulifera +, Luzula multiflora +. IIb: 3,3.1. Centaurea jacea +; 3,3.2. Cerastium holosteoides +. IIc: 1. Cirsium palustre +; 2. Aquilegia vulgaris +; 3,3.1. Galium uliginosum +, Lotus uliginosus +; 3,3.2. Lychnis flos-cuculi +. IId: 3,3.1. Petasites hybridus +. IIf: 2. Scutellaria galericulata +; 3,3.2. Thalictrum flavum +. IIg: 2. Crepis biennis +; 3, 3.1. Bromus hordeaceus +; IIh: 3,3.2. Campanula patula +. IIIc: 1. Chamomilla suaveolens +. IVa: 3,3.1. Vicia sativa +. IVb: 2. Aethusa cynapium +. IVc: 3,3.2. Vicia hirsuta +. Vb: 3,3.1. Echinochloe crus-galli +; Polygonum lapathifolium ssp. incanum +. Vc: 2. Sonchus asper +. Vd: 3,3.2. Digitaria ischaemum +, Setaria glauca +, S. viridis +. Ve: 1. Malva neglecta +; 3,3.1. Bromus sterilis +, Descurainia sophia +, Lactuca serriola +, Sisymbrium altissimum +. VIb: 3,3.1. Dipsacus fullonum +; 3,3.2. Oenothera rubricaulis +; VIc: 2. Anchusa officinalis +; 3,3.1. Cynoglossum officinale +, Reseda lutea +; 3,3.2. Verbascum thapsiforme +. VIe: 3,3.1. Echinocystis lobata 1. VIg: 1. Cucubalus baccifer (Ch:Cs) +. VIh: 1. Elscholtzia ciliata +, Phlox sp. +, Petroselinum crispum +; 2. Peonia sp. +, Polygonum persicaria +; 3,3.1. Allium vineale +, Anchusa arvensis +, Carex sp. +, Festuca sp. +, Galeopsis ladanum +, Hieracium sp. +, Mentha x piperata +, Trifolium sp. +; 3,3.2. Crepis tectorum +, Senecio jacobaea +, Trifolium campestre +. VIIa: 1. Erigeron acer +; 3,3.1. Corynephorus canescens +, Hieracium pilosella +, Sedum maximum +; 3,2.2. Arenaria serpyllifolia +, Cerastium arvense +, Festuca psammophila +, Sedum acer +. VIIb: 1. Anthemis tinctoria +, Bromus erectus +; 2. Verbascum thapsus +, 3,3.1. Plantago media +; 3,3.2. Acinos arvensis +, Campanula glomerata +, Scabiosa ochroleuca +. VIIIa: 3,3.1. Verbascum nigrum +, 3,3.2. Carex muricata +, Centaurium erythraea +. VIIIb: 3,3.1. Campanula rapunculoides +, Medicago sativa ssp. falcata +, Origanum vulgare +. VIIId: 3,3.1. Euphorbia esula +, Festuca heterophylla +, 3,3.2. Campanula cervicaria +, Festuca duriuscula 1, Hieracium umbellatum +, Hypericum quadrangulum +, Hypochoeris radicata +, Turritis glabra +. IXa: 3,3.1. Adoxa moschatellina +, Epipactis helleborina +, IXc: 4. Festuca gigantea +. IXe: 4. Cephalanthera damasonium +. IXf: 3,3.1. Holcus mollis +, IXh: 3,3.1. Stellaria nemorum +, Valeriana officinalis ssp. sambucifolia +, 3,3.2. Carex pallescens +, Solidago virgaurea +, 4. Carex ericetorum +.

D. Mosses and algae: Ib: 3,3.2. Polytrichum piliferum +, Rhacomitrium canescens +. IIa: 3,3.2. Atrichum undulatum +. IIb: 1. Mniobryum delicatulum +, Tortula subulata +; 3,3.1. Amblystegium varium +, Plagiomnium affine +, Thuidium philibertii +; 3,3.2. Brachythecium velutinum +, Calliergon cuspidatum +, Eurhynchium swartzii +, Mnium affine +.

Explanation: A - species frequency: A_1 — number of occurrences, A_2 — class of per cent constancy (according to Table 2), B — per cent species cover: B_1 — total (according to Table 2), B_2 — class of mean per cent species cover. (ss) — syntaxonomic group with only sporadic species listed at the end of the Table.

Notes: In the list of species occurring only in one phytosociological record against all the phytocenoses examined (no. 1- 4) the following were given respectively: no. of syntaxonomic group and phytocenose no., and after the species name — the degree of its per cent cover in the 5-grade scale (defined in Table). In brackets, after the species name, the assignment of the species given to new, debatable syntaxonomic groups was defined according to the data by Brzeg (7, 8): G-cs — order *Galio-Calystegietalia sepium*, Cs — alliance *Convolvulion sepium*.

Table 5. Syntaxonomic values of plant species in particular syntaxonomic groups: 1. *Rudbeckietum laciniatae*, 2. *Solidaginetum canadensis*, 3. *Solidaginetum giganteae*, 3.1. *S.g. aegopodietosum*, 3.2. *S.g. rubetosum*, 4. degraded forest of *Tilio-Carpinetum* with *Solidago gigantea*

Number of association			1.			2.			3.			3.1.			3.2.			4.		
Syntaxonomical units and systematic value			z	g	D	z	g	D	z	g	D	z	g	D	z	g	D	z	g	D
			A, B. Trees and shrubs																	
I.	Al		Alliarion	1	1	0,008	1	2	0,026	1	4	0,006	1	1	0,001	1	3	0,032	.	.	.
	Xs		other synanthropic species	1	1	0,008	5	5	0,032	6	12	0,010	1	2	0,004	6	10	0,059	.	.	.
	Cl	(total)	Epilobietea angustifolii	.	.	.	.	.	.	2	9	0,016	1	1	0,001	2	8	0,113	2	2	0,039
	Cl	(total)	Rhamno-Prunetea	.	.	.	3	3	0,019	4	11	0,012	1	2	0,004	4	9	0,072	4	5	0,121
II.	Cl	(total)	Alnetea glutinosae	.	.	.	.	.	.	1	1	0,0004	.	.	.	1	1	0,003	1	1	0,019
	Cl	(total)	Salicetea purpureae	2	3	0,038	3	5	0,054	5	7	0,004	.	.	.	5	7	0,035	.	.	.
	Cl		Querco-Fagetea	.	.	.	1	1	0,006	2	9	0,016	1	1	0,001	2	8	0,113	3	11	0,785
	O		Fagetalia silvaticae	.	.	.	1	1	0,006	1	1	0,0004	.	.	.	1	1	0,003	2	6	0,350
	Al		Alno-Padion	.	.	.	.	.	.	2	4	0,003	.	.	.	2	4	0,028	.	.	.
	Al		Carpinion betuli	.	.	.	.	.	.	3	9	0,011	.	.	.	3	9	0,096	3	22	3,140
	Al		Fagion silvaticae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	0,078
	Cl		Vaccinio-Piceetea	.	.	.	.	.	.	1	2	0,002	.	.	.	1	2	0,014	.	.	.
	Al		Dicrano-Pinion	.	.	.	.	.	.	1	5	0,010	.	.	.	1	5	0,088	1	14	3,815
	Xl		other forest species	2	2	0,017	1	1	0,006	11	63	0,147	.	.	.	11	63	1,280	10	45	0,394
			C: Herbaceous plants																	
I.	Cl	(total)	Phragmitetea	3	5	0,070	3	3	0,019	5	21	0,036	5	17	0,054	2	4	0,028	.	.	.
	Cl	(total)	Bidentetea tripartiti	4	5	0,052	2	2	0,013	5	7	0,004	3	4	0,005	3	3	0,011	.	.	.
	Cl	(total)	Alnetea glutinosae	.	.	.	1	1	0,006	2	2	0,001	2	2	0,002	.	.	.	.	.	.
	Xb		other meadow and marshy species	4	5	0,052	3	4	0,035	9	20	0,018	7	10	0,013	4	10	0,089	3	4	0,104
II.	Cl	(total)	Nardo-Callunetea	.	.	.	.	.	.	4	4	0,002	.	.	.	4	4	0,014	1	1	0,019
	Cl		Molinio-Arrhenatheretea	9	28	0,731	11	44	1,145	16	185	0,872	15	134	1,119	12	51	0,769	2	4	0,156
	O		Molinietalia coeruleae	4	8	0,134	1	1	0,006	9	35	0,055	7	28	0,105	4	7	0,043	1	2	0,078
	Al		Filipendulo-Petasition	5	5	0,042	3	3	0,019	6	13	0,011	3	9	0,025	3	4	0,019	.	.	.
	Al		Calthion	.	.	.	.	.	.	1	2	0,002	.	.	.	1	2	0,014	.	.	.
	Al		Molinion	.	.	.	3	5	0,024	3	21	0,060	2	15	0,105	2	6	0,064	1	4	0,311
	O		Arrhenatheretalia	4	24	1,208	5	18	0,360	8	89	0,404	7	72	0,692	3	17	0,342	1	2	0,078
	Al		Arrhenatherion elatioris	4	12	0,302	5	12	0,230	7	41	0,098	5	37	0,256	4	4	0,014	.	.	.
	Al		Cynosurion	2	3	0,038	1	1	0,006	1	4	0,006	1	3	0,008	1	1	0,003	.	.	.
III.	O	(total)	Trifolio fragiferi-Agrostietalia	4	15	0,472	6	11	0,128	7	51	0,151	7	40	0,214	5	11	0,086	.	.	.
	O	(total)	Plantaginetalia majoris	2	4	0,067	2	3	0,029	2	12	0,029	2	11	0,056	1	1	0,003	.	.	.
	O	(total)	Polygono-Poëtea annuae	2	4	0,067	2	3	0,029	2	13	0,023	3	8	0,020	2	5	0,044	.	.	.
	Cl		Agropyretea intermedi-repentis	6	18	0,453	7	43	1,925	7	194	2,193	7	159	3,376	6	35	0,724	1	1	0,019
IV.	Cl		Secalietea	.	.	.	1	1	0,006	2	2	0,001	2	2	0,002	.	.	.	.	.	.
	O	(total)	Secalietalia	.	.	.	1	1	0,006	.	.	.	.	.	.	.	.	.	.	.	.
	O		Aperetalia	.	.	.	1	3	0,072	2	2	0,001	.	.	.	2	2	0,007	.	.	.
	Al		Aphanion	.	.	.	.	.	.	3	8	0,009	3	8	0,020	.	.	.	.	.	.
V.	Cl		Chenopodietea	1	4	0,134	2	3	0,029	3	7	0,007	3	7	0,015	.	.	.	.	.	.
	O		Polygono-Chenopodietalia	.	.	.	1	1	0,006	3	3	0,001	3	3	0,003	.	.	.	.	.	.
	Al		Eu-Polygono-Chenopodion	2	2	0,017	2	2	0,013	3	6	0,005	3	6	0,011	.	.	.	.	.	.
	Al		Panico-Setarion	.	.	.	.	.	.	3	3	0,001	.	.	.	3	3	0,011	.	.	.
	O,	Al	Sisymbrietalia, Sisymbrion	1	1	0,008	4	5	0,041	9	14	0,009	9	12	0,015	2	2	0,007	.	.	.
VI.	Cl		Artemisietea vulgaris	4	40	3,356	5	61	4,840	5	175	2,498	5	134	3,357	5	41	1,192	1	7	0,953
	O		Onopordetalia acanthii	1	6	0,302	2	7	0,159	4	29	0,086	4	24	0,135	2	5	0,044	.	.	.
	Al		Onopordion acanthii	4	5	0,052	6	11	0,131	10	42	0,072	8	32	0,120	6	10	0,059	.	.	.
	Al		Eu-Arction	8	13	0,177	7	25	0,581	10	42	0,072	10	38	0,135	4	4	0,014	.	.	.
	Al		Alliarion	4	8	0,134	6	10	0,110	10	37	0,056	9	33	0,113	4	4	0,014	.	.	.
	O		Convolvuletalia sepium	1	3	0,075	1	8	0,416	1	26	0,276	1	22	0,452	1	4	0,452	.	.	.
	Al		Senecion fluviatilis	8	52	2,836	7	52	2,512	8	142	1,028	8	100	1,168	4	42	1,564	1	14	3,815
	(O)		(Galio-Calystegietalia sepium)	8	54	3,058	8	39	1,236	11	156	0,902	11	125	1,328	5	31	0,682	2	3	0,087
	(Al)		(Convolvulion sepium)	11	57	2,478	13	71	2,522	14	181	0,954	14	134	1,199	6	47	1,306	1	14	3,815
	Xs		other synanthropic species	17	34	0,570	20	39	0,494	40	173	0,305	34	110	0,333	19	63	0,741	4	10	0,049
VII.	Cl	(total)	Sedo-Scleranthetea	.	.	.	2	2	0,013	11	16	0,009	6	7	0,008	8	9	0,036	.	.	.
	Cl	(total)	Festuco-Brometea	5	6	0,060	5	10	0,130	12	41	0,057	8	29	0,098	9	12	0,057	1	1	0,019
VIII.	Cl	(total)	Epilobietea angustifolii	3	13	0,473	5	21	0,574	14	127	0,470	7	58	0,449	12	69	1,407	5	21	1,717
	Cl	(total)	Trifolio-Geranietea sanguinei	.	.	.	2	3	0,029	7	18	0,019	6	6	0,006	3	12	0,170	2	4	0,156
	Cl	(total)	Rhamno-Prunetea	.	.	.	.	.	.	1	3	0,004	1	1	0,001	1	2	0,014	.	.	.
	Xz		other species of scrub	5	10	0,168	6	26	0,733	22	92	0,157	12	50	0,195	18	42	0,347	5	18	1,261
IX.	Cl		Querco-Fagetea	3	21	1,233	2	13	0,549	7	39	0,089	3	28	0,244	6	11	0,071	5	26	2,631
	O		Fagetalia silvaticae	2	2	0,017	1	2	0,026	6	25	0,042	2	5	0,012	6	20	0,236	8	31	2,338
	Al		Alno-Padion	.	.	.	.	.	.	1	2	0,002	1	2	0,004	.	.	.	1	1	0,019
	Al		Carpinion betuli	1	4	0,134	.	.	.	1	1	0,0004	.	.	.	1	1	0,003	.	.	.
	Al		Fagion silvaticae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	11	1,177
	Cl		Quercetea robori-petraeae	.	.	.	.	.	.	1	1	0,0004	1	1	0,001	.	.	.	.	.	.
	Cl		Vaccinio-Piceetea	.	.	.	.	.	.	2	2	0,001	.	.	.	2	2	0,007	3	10	0,649
	Xl		other forest species	5	10	0,168	2	2	0,013	20	46	0,043	7	14	0,026	15	32	0,242	19	81	6,720
			D. Mosses and algas																	
I.	Cl	(total)	Polygono-Poëtea annuae	1	1	0,008	.	.	.	3	6	0,005	3	6	0,011	.	.	.	.	.	.
	Cl	(total)	Sedo-Scleranthetea	.	.	.	1	2	0,026	4	16	0,026	1	7	0,046	4	9	0,072	.	.	.
II.	O		Fagetalia silvaticae	.	.	.	.	.	.	1	1	0,0004	.	.	.	1	1	0,003	.	.	.
	Xl		other forest and all species	14	33	0,652	7	14	0,182	25	62	0,063	13	36	0,093	13	26	0,184	3	6	0,233

Explanation: z — number of species, g — sum total of species occurrences of all syntaxonomic groups, G — syntaxonomic values of species. Data according to Table 4, these values were calculated according to the Pawłowski (60) formula.

Table 6. Assignment of the 193 phytosociological documentation records quoted to particular phytocenoses: 1. *Rudbeckietum laciniatae*, *Solidaginetum canadensis*, 3.1. *Solidaginetum giganteae aegopodietosum*, 3.2. *S.g. rubetosum*, 4. community of degraded *Tilio-Carpinetum* with *Solidago gigantea*

Basic informations about exploited phytosociological materials[x]	Number of community Number of records
Kucharczyk (1990). Av. Com. Rudbeckia laciniata. Pp. 54	1: 26/110
Fijałkowski, Adamczyk (1990). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 26	1: 1/657, 2/656
Fijałkowski, Pietras, Urban (1988). Av. Ass. Rudbeckio- Solidaginetum R. Tx. et Raabe 1950. Table 6	1: 3/92, 4/93, 10/91
Kędzierawska (1984). Av, Oaa, EA. Ass. Aegopodio--Rudbeckietum Fijałk. mskr. Table 6	1: 5/92, 6/90, 7/91, 11/98, 12/95, 14/96, 19/97, 20/94, 21/93, 28/99
Fijałkowski (1978). Av, Cas, Snf. Ass. Rudbeckio--Solidaginetum R. Tx. et Raabe 1950. Table 21	1: 13/497, 23/498, 29/499. 2: 31/500, 32/501
Anioł-Kwiatkowska (1974). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 31	1: 24/5, 25/6. 2: 43/2, 47/3, 48/4, 49/1
Żarnowiec (1983). Av. Oaa, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 31	1: 8/18, 9/19, 15/15, 16/16, 17/14, 18/17, 27/13, 2: 30/12, 52/11, 53/10, 55/9, 58/8. 3.1: 67/6, 69/7, 96/2, 122/3
Brzeg (mskr.). Av, GGs, Cns. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table ?	1: 22/5. 2: 54/8, 56/7. 3.1: 88/4, 120/1, 123/2. 3.2: 146/9, 149/3, 167/6
Kępczyńska-Rijken (1977). Av, Cas, Snf. Ass. Solidago-Helianthus Kopecký 1961. Table 3	2: 57/3
Kędzierawska (1984). Epa, Eaa, Ena. Ass. Solidaginetum canadensis Fijałk. mskr. Table 11	2: 33/203, 34/200, 35/201, 36/210, 37/207, 38/205, 39/209, 40/204, 41/208, 50/206, 51/202
Rostański, Gutte (1971). Av, Oaa, EA. Ass. Tanacetum vulgare - Artemisia vulgaris. Table 9	2: 59/8, 60/10. 3.1: 131/25
Kępczyńska-Rijken (1977). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 14	2: 44/4, 45/5, 46/3. 3.1: 61/9, 62/7, 66/8, 68/1, 81/2, 94/6
Święs, Urban (1986). RS, Oaa, EA. Ass. Rudbeckio--Solidaginetum R. Tx. et Raabe 1950. Table 8	2: 42/137. 3.1: 75/140, 90/139, 130/138, 134/142, 137/141
Kucharczyk (1990). Av. Com. Solidago gigantea. Pp. 53	3.1: 124/690
Święs (1985). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 9	3.1: 112/116
Borysiak (1994). Av, GGa, Cns. Com. Solidago gigantea - Solidago canadensis Kopecký 1974. Table 37	3.1: 125/258
Święs (1986). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 8	3.1: 74/194, 102/193
Święs, Piórecki (1986). Rs, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 9	3.1: 101/143, 105/142
Faliński, Falińska (1965). Av, Cas, Snf. Com. Chaerophyllum aromaticum i Solidago serotina. Table 6	3.1: 84/10, 99/7, 100/8
Święs, Kucharczyk (1982). Rs, Oaa, EA. Com. Solidago serotina. Table 5	3.1: 77/56, 83/58, 98/55, 108/57
Kucharczyk H., Kucharczyk M. (1983). RS, Oaa, On. Com. Solidago serotina. Table 4	3.1: 91/52, 92/53, 103/51, 118/50
Święs (1993). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 13	3.1: 82/263, 104/267, 107/262, 113/266, 114/265, 115/261, 129/264
Kępczyński, Rutkowski (1981). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 6	3.1: 80/3, 117/4, 126/6. 3.2: 168/5
Święs (1989). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 17	3.1: 72/281, 79/282, 97/285, 110/287, 135/284, 138/286, 3.2: 145/283
Janecki (1983). RS, Epa, Ena. Com. Solidago serotina. Table 20	3.1: 70/5, 71/4, 73/6, 78/8, 86/3, 111/2, 136/1. 3.2: 144/7
Święs, Witkowska-Wawer (1988). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 17	3.1: 76/364, 89/363, 95/365, 106/371, 109/368, 116/370. 119/369, 121/366. 3.2: 166/367
Święs, Kwiatkowska (1996). Av, Cas, Snf. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 12	3.1: 85/248. 3.2: 143/249, 147/250
Brzeg (1983). Av, GGs, Cns. Ass. Rudbeckio-Solidaginetum R. Tx. et Raabe 1950. Table 8	3.1: 63/8, 64/7, 65/3, 87/6, 93/5. 3.2: 151/4, 161/1, 162/2
Kędzierawska (1984). Epa, Eaa, Ena. Ass. Solidaginetum serotinae Fijałk. mskr. Table 11	3.1: 132/213. 3.2: 154/214, 164/212, 165/215, 169/211
Fijałkowski, Pietras, Urban (1988). Epa. Ass. Rubo--Solidaginetum serotinae Fijałk. 1978. Table 2	3.1: 139/22, 140/21. 3.2: 150/20, 177/17, 178/19, 179/19
Łuczycka-Popiel (1993). Epa, Eaa, Ena. Ass. Rubo-Solidaginetum serotinae Fijałk. 1978. Table 3	3.2: 148/85
Święs (1988). Epa, Eaa, Ena. Ass. Rubo-Solidaginetum Fijałk. 1978. Pp. 127	3.2: 176/2
Fijałkowski (1979). Epa. Ass. Rubo-Solidaginetum Fijałk. 1978. Table 2	3.2: 155/53, 174/55, 175/54
Fijałkowski (1978). Epa, Eaa, Ena. Ass. Rubo-Solidaginetum serotinae ass. nova prov. Table 27	3.2: 156/158, 157/659, 158/654, 159/657, 160/655, 163/656, 170/663, 171/660, 172/661, 173/662
Łuczycka-Popiel (1985). Epa. Ass. Rubo-Solidaginetum serotinae Fijałk. 1978. Table 1	3.2: 141/29, 142/33, 152/28, 153/30. 4: 180/31, 181/32, 182/34, 183/35
Święs (1987/88). QF. Com. Tilio-Carpinetum with Solidago serotina. Table 3	4: 184/50
Święs (1990). QF. Com. Quercus-Solidago gigantea. Com. Pinus-Rubus hirtus with Solidago gigantea and with Pteridium aquilinum and Solidago gigantea. Table 3	4: 185/184, 186/185, 187/186, 188/187, 189/188, 190/183, 191/190, 192/189, 193/182

Explanation: x — author publication year, rank (ass. — association, comm. — community) of the phytocenose named and its assignment to a higher phytosociological unit: RS — cl. *Rudero secalietea*, Av — cl. *Artemisietea vulgaris*, Oaa —ord. *Onopordetalia acanthii*, On - all. *Onopordion*, EA — all. *Eu-Arction* (-- *Arction lappae*), Cas — ord. *Convolvuletalia sepium*, Snf — all. *Senecion fluviatilis*, Gcs — ord. *Galio-Calystegietalia sepium*, Eaa — ord. *Epilobietalia angustifolii*, Ena — ass. *Epilobion angustifolii*, OF — cl. *Querco-Fagetea*, Fas — ord. *Fagetalia silvaticae*, Cnb — all. *Carpinion betuli*.

Note: Nos of phytosociological records: the first — according to their succession order in the working table (not included), and after "/" — according to the authors cited.

district (subass. 3.1. rec. 72, 75, 77, 79, 82, 83, 91, 92, 97, 98, 101, 103–105, 107, 108, 110, 113–115, 118, 129, 130, 134–138, 145).

Division: East Carpathians — Wooded Carpathians district, Przemyśl Foothills subdistrict (subass. 3.1, rec. 76, 89, 95, 106, 109, 112, 116, 119, 121; subass. 3.2, rec. 166).

In the association *Solidaginetum giganteae* the two subassociations distinguished: *S. giganteae aegopodietosum* and *S. giganteae rubetosum* considerably differ in respect of biotopic conditions and the floristic structure (Tabs 1–5).

3.1. *Solidaginetum giganteae aegopodietosum*

This subassociation was described on the basis of 80 phytosociological records that come from as many as four biotopic and floristic circles:

— Typically ruderal: grassy and shrubs-covered squares in and outside town, wasteland, gardens, rubbish heaps, railway and highway embankments, old loam heaps, grounds adjoining buildings, fences and railings (rec. 61, 62, 66–69, 72, 75–77, 79, 81–83, 85, 90, 92, 94, 96–98, 102, 106, 108, 110, 113, 118, 122, 127–135, 137, 138).

— Weakly ruderal: grassy and shrubs-covered slopes of river valleys, loess ravines and local heights (rec. 65, 70, 71, 73, 74, 78, 86, 89, 91, 93, 95, 101, 103–105, 107, 111, 112, 114–116, 124, 136).

— Seminatural: cleared riverside forests, brushwood of damp valleys (rec. 63, 64, 80, 84, 87–100, 109, 117, 119–121, 123, 125, 126).

— Seminatural: brushwood margins and cuttings of oak and hornbeam forests (rec. 139, 140).

3.2. *Solidaginetum giganteae rubetosum*

This association was described on the basis of 40 phytosociological records taken from the following biotopic types:

— Weakly ruderal: herbaceous, shrubs- and bushes-covered in- and out-of-town cemeteries, squares, wasteland, and the slopes of local heights (rec. 143, 145, 147, 151, 154, 164, 165, 169).

— Seminatural: cleared riverside forests, brushwood of damp valleys (rec. 146, 149, 161, 162, 166–168).

— Seminatural: brushwood margins and cuttings of oak and hornbean forests (rec. 141, 142, 144, 148, 150, 152, 153, 155–160, 163, 170–179).

In the association *Solidaginetum giganteae* the most numerous are the species characteristic of definite units of classes *Molinio-Arrhenatheretea, Artemisietea vulgaris* and *Agropyro intermedii-repentis*. Out of the species recorded in that association the highest classes of constancy and cover are attained by *Solidago gigantea*. At the same time it is the only plant

characteristic of that association and with a high rank of fidelity. In the *Solidaginetum giganteae* association species regarded as characteristic of other definite associations of the North-American neophyte group occur rarely and in very small numbers. They are: *Solidago canadensis, Rudbeckia hirta, R. laciniata, Aster salicifolia* and *Helianthus tuberosus.*

The two subassociations distinguished in the association *Solidaginetum giganteae: S. g. aegopodietosum* and *S. g. rubetosum* have numerous species in common but with highly differing classes of constancy and cover. The plants found more often in the former subassociation include: *Vicia cracca, Taraxacum officinale, Arrhenatherum elatius, Ranunculus repens, Cirsium arvense, Convolvulus arvensis, Equisetum arvense, Silene alba, Calystegia sepium, Galium aparine, Glechoma hederacea* and *Aegopodium podagraria.* However, the plants that occur far more often in the latter subassociation than in the former are only: *Poa pratensis, Festuca rubra* and *Veronica chamaedrys.* In the two subassociations: *S. g. aegopodietosum* and *S. g. rubetosum* there are few phytosociological records with plants, apart from *Solidago gigantea,* with higher, two-three grade classes of cover. In both subassociations this applies most often to the following species: *Urtica dioica, Tanacetum vulgare, Equisetum arvense, Elymus repens, Rubus caesius* and *Festuca rubra.* It must also be noted that there are slightly more species with a higher degree of cover in the former than in the latter subassociations. These are: in the former subassociation — *Aegopodium podagraria, Poa trivialis, Rudbeckia hirta, Solidago canadensis, Glechoma hederacea* and *Galium aparine,* and in the latter subassociation — only *Rubus plicatus, R. idaeus* and *Calamagrostis epigeios.* Besides, fundamental floristic differences between the subassociations *S. g. aegopodietosum* and *S. g. rubetosum* are seen with respect to the species composition of trees, shrubs, segetal plants and bryophytes (Tab. 4).

The former subassociation has a highly herbaceous structure while the latter of the brushwood–herbaceous type. Segetal plants are almost entirely absent from the latter subassociation. In the case of bryophytes it should be noted that out of 33 species recorded in the former or the latter subassociation only two identical species are found in both subassociations (Tab. 4).

4. Forest communities with *Solidago gigantea*

(Fig. 1. Tabs 1–6)

The studied group of forest communities with *Solidago gigantea* is composed of the following forms of phytocenoses:

— The most tree-covered forms of the still weakly distinguished association *Rubo-Solidaginetum serotinae* (rec. 180–183).

— A highly degraded association of *Tilio-Carpinetum* linked to the mixed coniferous forest in the forms of: a subassociation *Tilio-Carpinetum fagetosum* with *Solidago gigantea* (rec. 184), a community with *Quercus-Solidago gigantea* (rec. 185–192), a community *Pinus-Rubus hirtus* with *Solidago gigantea* (rec. 1–190), a community *Pinus-Rubus hirtus* with *Pteridium aquilinum* and *Solidago gigantea* (rec. 191–193).

In Poland those forms of forest communities with *Solidago gigantea* were described on the basis of 14 phytosociological records (Fig. 1, Table 6) that come only from Podlasie (rec. 180–183) and from the Lublin Upland (rec. 184–191).

The investigated group of forest communities with *Solidago gigantea* is clearly differentiated with respect to the general floristic structure from the earlier group of the associations *Rudbeckietum laciniatae, Solidaginetum canadensis* and *S. giganteae*. Attention must be primarily focused on the recorded case of the high expansion of a synanthrope *Solidago gigantea* in the area of the well-stocked forest stand with the comparatively well-preserved undergrowth, with co-dominants like *Galium odoratum, Anemone nemorosa, Rubus hirtus, Oxalis acetosella,* less frequently *Pteridium aquilinum* and *Vaccinium myrtillus*. Synanthropic plants, apart from *Solidago gigantea*, are represented in very small numbers by *Urtica dioica, Galeopsis pubescens, Festuca rubra, Agrostis tenuis, Veronica chamaedrys, Carex hirta* and *Holcus lanatus*.

GENERAL DYNAMICS

Most studies on the plant communities discussed above are characterized by too general data on the biotopic conditions of phytosociological documentation. With more thorough-going investigations it is possible to distinguish among the phytocenoses examined primarily their definite biotopic-floristic forms, mainly of two types: herbaceous-ruderal (segetal, extremely ruderal, meadow types) and brushwood-forest (riverside forests; all. *Alno-Padion, Salicion albae, Tilio-Carpinetum* forests and *Querco robori-Pinetum* forests). There are also other possibilities of more accurate characterization of the above phytocenoses, especially in two respects the succession stage of development (initial, optimal, final) and the general, relatively stable, syntaxonomic structure (subassociations, variants, facies).

REFERENCES

1. Anioł-Kwiatkowska J.: Flora i zbiorowiska synantropijne Legnicy, Lublina i Polkowic. Acta Univ. Wratisl. 229; Prace Bot. **19**, 1–152 (1974).
2. Borysiak A.: Struktura aluwialnej roślinności lądowej środkowego i dolnego biegu Warty. Wydawn. Nauk. Uniw. im. A. Mickiewicza w Poznaniu. Seria Biologia **52**, 1–258 (1994).
3. Böcker R.: Vegetations- und Grundwasserverhältnisse im Landschaftsschutzgebiet Tegeler Fliesstal (Berlin West). Verh. Bot. Ver. Prov. Brandenburg **114**, 1–164 (1978).
4. Brandes D.: Neophytengesellschaften der Klasse *Artemisietea* im südöstlichen Niedersachsen. Braunschweig Naturk. Schr. **1**, 183–211 (1981).
5. Brandes D., Brandes E.: Ruderal- und Saumgesellschaften des Etschtals zwischen Bozen und Rovereto. Tuexenia **1**, 99–134 (1981).
6. Bornkamm R.: Die Unkrautvegetation im Bereich der Stadt Köln. I. Pflanzengesellschaften. Decheniana **126** (1–2), 267–306 (1974).
7. Brzeg A.: Zbiorowiska okrajkowe okolic Rakowa i Ramieszowa na północ od Wrocławia. Bad. Fizjogr. nad Polską Zach., seria B **34**, 145–163 (1983).
8. Brzeg A.: Przegląd systematyczny zbiorowisk okrajkowych dotąd stwierdzonych i mogących występować w Polsce. Fragm. Flor. et Geobot. **34** (3–4), 385–424 (1989).
9. Brzeg A.: Zbiorowiska neofitów Wielkopolski. Bad. Fizjogr. nad Polską Zach., seria B (mss.).
10. Czaplewska J.: Zbiorowiska ruderalne na terenie Aleksandrowa Kujawskiego, Ciechocinka, Nieszawy i Włocławka. Stud. Soc. Scient. Torun., seria D **11** (2), 28–41 (1980).
11. Faliński B., Falińska K.: Szata roślinna rezerwatu krajobrazowego „Dolina rzeki Wałszy" (Wzniesienie Górowskie). Mater. Zakł. Fitosoc. Stos. UW **7**, 1–83 (1965).
12. Fijałkowski D.: Synantropy roślinne Lubelszczyzny. Lub. Tow. Nauk. Prace Wydz. Biol. **5**. Warszawa-Łódź 1978.
13. Fijałkowski D.: Zbiorowiska roślinne w otoczeniu Zakładów Azotowych w Puławach. Ann. Univ. Mariae Curie-Skłodowska, sectio C **34**, 107–121 (1979).
14. Fijałkowski D.: Zespoły roślinne Lubelszczyzny. Wydawn. UMCS, Lublin 1991.
15. Fijałkowski D., Adamczyk B.: Zespoły i flora projektowanego rezerwatu Skierbieszowskiego Parku Krajobrazowego. Wydawn. UMCS, Lublin 1990.
16. Fijałkowski D., Pietras T., Urban D.: Zbiorowiska antropogeniczne Sobiborskiego Parku Krajobrazowego. Ann. Univ. Mariae Curie-Skłodowska, sectio C **43**, 275–311 (1988).
17. Gödde M.: Vergleichende Untersuchung der Ruderalvegetation der Grossstädte Düsseldorf, Essen und Münster. Düsseldorf 1986 (mss.).
18. Görs S.: Nitrophile Saumgesellschaften im Gebiet der Taubergiesen. [in:] Das Taubergiesengebiet Natur- und Landschaftsschutzgebiet Bad.-Württ. Ludwigsburg **7**, 323–354 (1974).
19. Görs S., Müller Th.: Beitrag zur Kenntnis der nitrophilen Saumgesellschaften Südwestdeutschlands. Mitt. Florist.-Soziol. Arb.-Gem. Serie N **14**, 153–168 (1982).

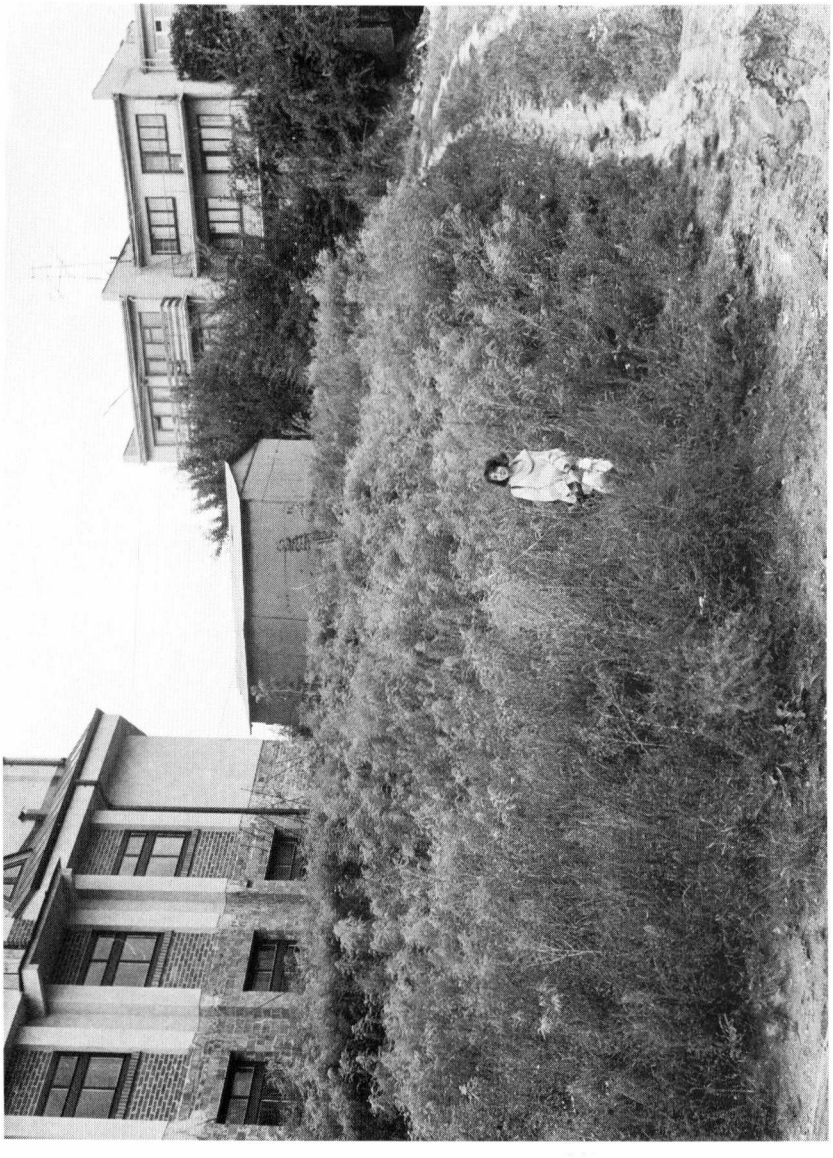

Fig. 2. Lublin, Czuby, in Jan Paweł II st. *Solidaginetum giganteae* association on the loess substratum
Foto F. Święs

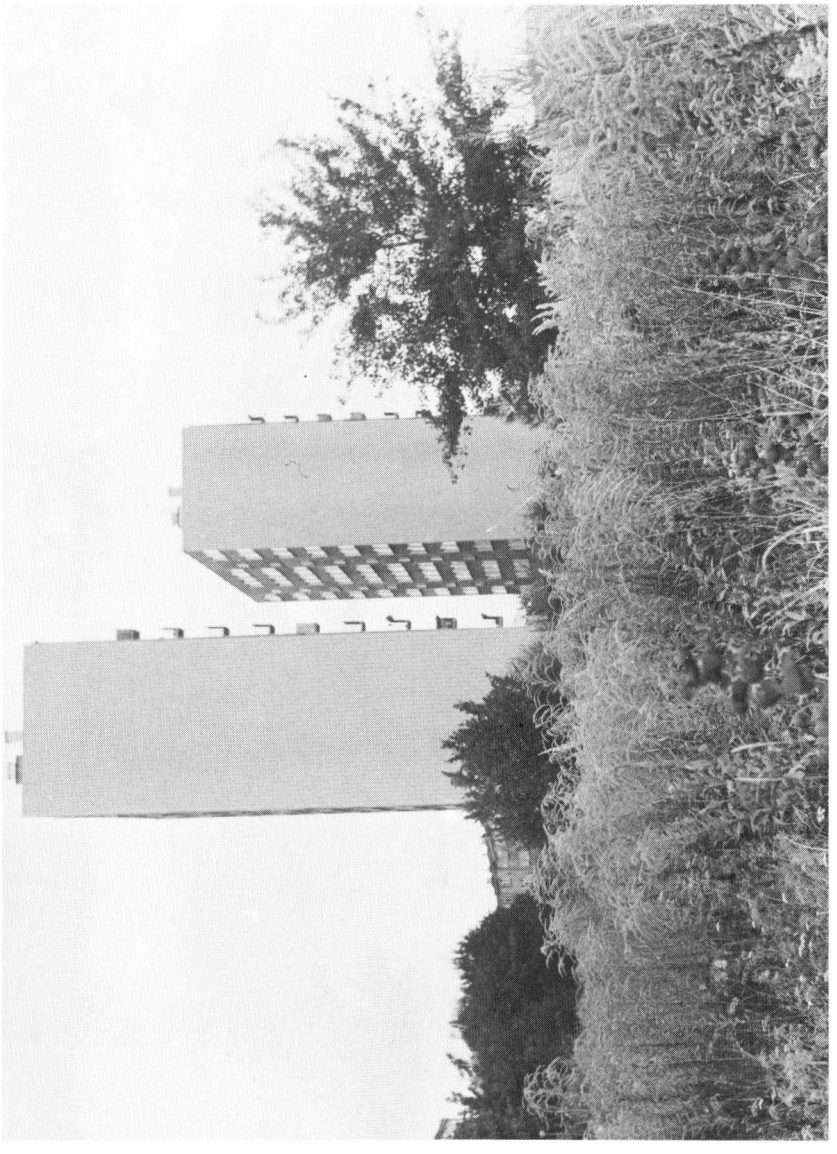

Fig. 3. Lublin, Sławinek, in Spadowa st. *Solidaginetum gigantae* association on a loess scarp
Foto F. Święs

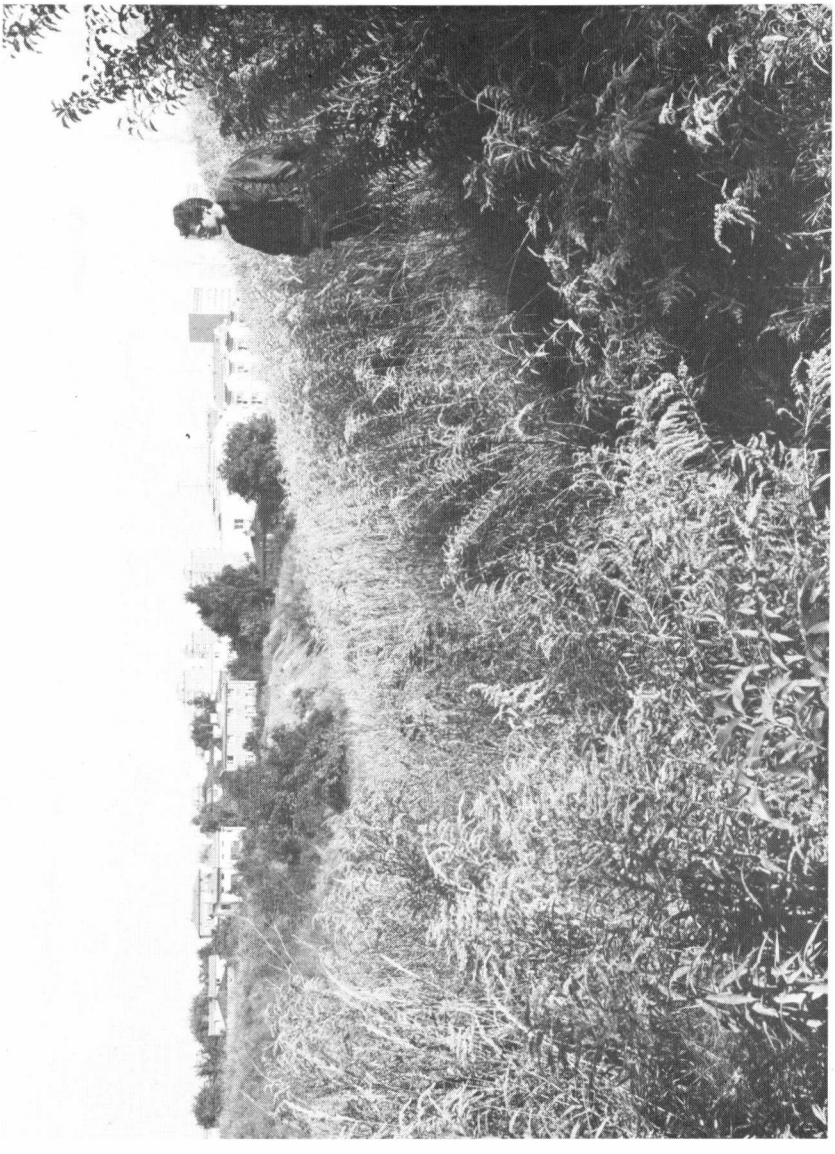

Fig. 4. Lublin, LSM housing estate, between Zan st. and Nowomiejska st. *Solidaginetum giganteae* association on the slope of a loess ravine

Foto F. Święs

Fig. 5. Village of Kąclowa, Nowy Sącz voivodeship. The valley of the Biała Dunajcowa river. *Solidaginetum gigantea* association on the edge of the degraded association of *Alnetum incanae*

Foto F. Święs

Fig. 6. Rzeszów. Pobitno, near the Wisłok river valley. *Solidaginetum giganteae* association among the degraded *Salici-Populetum* association

Foto F. Święs

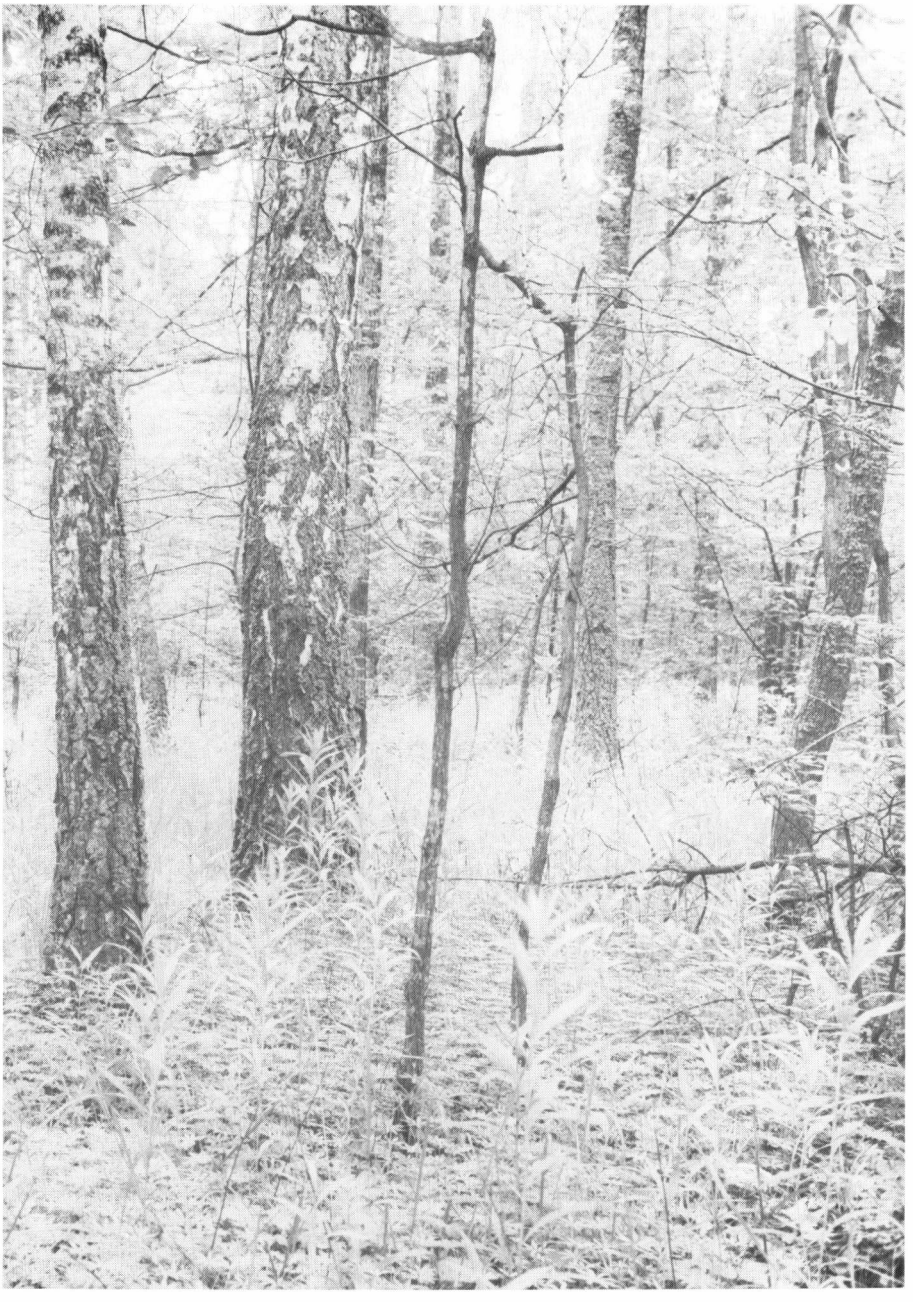

Fig. 7. Polichna-Mosty, near the Kraśnik–Rzeszów highway. Expansion of *Solidago gigantea* in the degraded forest of *Tilio-Carpinetum*

Foto F. Święs

20. Grüll F.: Málo známá pionýrská společenstva rostlin na obnaených pudách staveništ města Brna. Preslia **54** (2), 1949–1966 (1982).
21. Gutte P.: Die Verbreitung einiger Ruderalpflanzengesellschaften in der weiteren Umgebung von Leipzig. Wiss. Z. Univ. Halle, Serie Math.-Natur. **15**, 937–1010 (1966).
22. Gutte P.: Ruderalpflanzengesellschafen West- und Mittelsachsens. Fedes Repert. **83** (1–2), 11–122 (1972).
23. Gutte P., Hilbig W.: Übersicht über die Pflanzengesellschaften des südlichen Teiles der DDR. XI. Die Ruderalvegetation. Hercynia N.F. **12** (1), 1–39 (1975).
24. Guzikowa M., Maycock P. F.: The invasion and expansion of three North American species of goldenrod (*Solidago canadensis* L. *sensu lato*, *S. gigantea* Ait. and *S. graminifolia* (L.) Salisb.) in Poland. Acta Soc. Bot. Polon. **55** (3), 367–384 (1986).
25. Hilbig W.: Die Pflanzengesellschaften der Umgebung von Dehlitz (Saale), Kreis Weissenfels. Wiss. Z. Univ. Halle, Serie Math.-Natur. **11**, 817–865 (1962).
26. Hilbig W.: Beitrag zur Kenntnis einiger wenig beachteter Pflanzengesellschaften Mitteldeutschlands. Wiss. Z. Univ. Halle, Serie Math.-Natur. **21**, 83–98 (1972).
27. Hilbig W.: Übersicht über die Pflanzengesellschaften des südlichen Teiles der DDR. VII. Die Unkrautvegetation der Acker, Gärten und Weinberge. Hercynia N.F. **10** (3), 393–427 (1973).
28. Hejný S., Kopecký K., Jehlik V., Krippelová T.: Přehled ruderálnich rostlinných společenstev Československa. Rozpr. Čs. Akad. Věd., Seria Mat.-Natur. **89** (2), 1–100 (1979).
29. Hetzel G., Ulmann J.: Wildkräuter im Stadtbild Würzburgs. Würzburger Univ. Schr. Z. Regionalforsch. **3**, 1–150 (1981).
30. Holzner W.: Einige Ruderalgesellschaften des Oberen Murtales. Verh. Zool.-Bot. Ges. **112**, 67–85 (1972).
31. Janecki J.: Człowiek a roślinność synantropijna miasta na przykładzie Warszawy. Rozpr. Nauk. i Monogr. Wydawn. SGGW–AR, Warszawa 1983.
32. Jasiewicz A.: Nazwy gatunkowe roślin naczyniowych flory polskiej. Fragm. Flor. et Geobot. **30** (3), 217–285 (1986).
33. Jarolinek J.: Ruderálne společenstva juhozápadnej časti Malých Karpat. Acta Bot. Slovaca, seria A **9**, 7–102 (1986).
34. Jehlik V.: Die Vegetationsbesiedlung der Dorftrümmer in Nordböhmen. Eine Studie über synantrope Flora und Vegetation. Rozpr. Čs. Akad. Věd., seria Math.-Natur. **81** (2), 1–91 (1971).
35. Jehlik B: The vegetation of railways in Northern Bohemia. I. Vegetace CSSR, seria A **14**, 1–368 (1986).
36. Kędzierawska Z.: Flora i zbiorowiska ruderalne cmentarzy oraz otoczenia obiektów sakralnych województwa chełmskiego. Instytut Biologii UMCS (mss.), Lublin 1984.
37. Kępczyńska-Rijken M.: Spatial complexes of ruderal communities in town (exemplified by Słupsk and Sławno). Phytocoenosis **6** (4), 229–327 (1977).
38. Kępczyński K., Rutkowski L.: Zbiorowiska wodne, szuwarowe i zaroślowe w dolinie Wisły na odcinku Nebrowo Wielkie–Jarzębina. Stud. Soc. Scient. Torun., seria D **11** (3), 1–35 (1981).

39. Knapp R.: Die Ruderalgesellschaften in Haale an der Saale und seiner Umgebung. Vervielf. Ms. Haale 1945.
40. Kopecký K.: Die flussbegleitende Neophytengesellschaft *Impatienti-Solidaginetum* in Mittelmähren. Preslia **39** (2), 151–166(1967).
41. Kopecký K.: Zur Syntaxonomie der natürlichen nitrophilen Saumgesellschaften in der Tschechoslowakei und zur Gliederung der Klasse *Galio-Urticetea*. Folia Geobot. Phytotax. **4** (2), 235–259 (1969).
42. Kopecký K.: Die antropogene nitrophile Saumvegetation des Gebirges Orlicke hory (Adlergebirge) und seines Vorlandes. Rozpr. Čs. Akad. Véd., seria Math.-Natur. **84** (1), 1–173 (1974).
43. Kopecký K.: Společenstva radu *Convolvuletalia sepium* a svazu *Convolvulion sepium* v Československu. Preslia. **57** (3), 235–246 (1985).
44. Kopecký K., Hejný S.: Die studien- und grassreichen Ruderalgesellschaften Böhmens unter Anwendung der deduktiven Methode der syntaxonomischen Klassifizierung. Folia Geobot. Phytotax. **24** (4), 357–380 (1990).
45. Koponen T., Isoviita P., Lammes T.: The bryophytes of Finland. An annotated checklist. Flora Fennica **6**, 1–46 (1977).
46. Kornaś J.: Prowizoryczna lista nowych przybyszów synantropijnych (kenofitów) zadomowionych w Polsce. Mat. Zakł. Fitoc. Stos. UW **25**, 43–66 (1968).
47. Kucharczyk M.: Zespoły i zbiorowiska roślinne Kazimierskiego Parku Krajobrazowego. Instytut Biologii UMCS (doctoral dissertation, mss.), Lublin 1990.
48. Kucharczyk H., Kucharczyk M.: Zbiorowiska ruderalne Sandomierza. Ann. Univ. Mariae Curie-Skłodowska, sectio C **38**, 153–163 (1983).
49. Linenbecker H.: Die Pflanzengesellschaften im Raum Bielefeld–Haale. Ber. Naturwiss. Ver. Bielefeld **20** (1), 67–170 (1971).
50. Lohmeyer W.: Über einige bach- und flussbegleitende nitrophile Stauden und Staudengesellschaften in Westdeutschland und ihre Bedeutung für den Ufer-Schutz. Natur. und Landsch. **46** (2), 166–168 (1969).
51. Łuczycka-Popiel A.: Zbiorowiska synantropijne w Lasach Kozłowieckich koło Lublina. Ann. Univ. Mariae Curie-Skłodowska, sectio C **40**, 291–307 (1985).
52. Łuczycka-Popiel A.: Roślinność synantropijna Lubartowa. Ann. Univ. Mariae Curie-Skłodowska, sectio C **48**, 159–176 (1983).
53. Matuszkiewicz W.: Przewodnik do oznaczania zbiorowisk roślinnych Polski. PWN, Warszawa 1981.
54. Meusel H., Jäger E., Weinert E.: Vergleichende Chorologie der zentraleuropäischen Flora. **3**, Jena 1965.
55. Moor M.: Pflanzengesellschaften schweizerischer Flussauen. Mitt. Schweiz. Anst. Forstl. Versuchswesen **34** (2), 220–360 (1958).
56. Müller Th., Görs S.: Halbruderale Trocken- und Halbtrockenrasen. Vegetatio **18**, 203–221 (1969).
57. Oberdorfer E.: Süddeutsche Pflanzengesellschaften. Pflanzensoziologie **10**, 1–564 (1957).
58. Oberdorfer E. (unter Mitarbeit von S. Görs, D. Korneck, W. Lohmeyer, Th. Müller, G. Philippi und P. Seibert): Systematische Übersicht der westdeutschen Phanerogamen- und Gefasskryptogamen-Gesellschaften. Schriftenr.-Reihe Vegetationsk. **2**, 7–62 (1967).

59. Oberdorfer E.: Süddeutsche Pflanzengesellschaften. III. Pflanzensoziologie. Ed. 2. **10**, 1–455 (1983).

60. Pawłowski B.: Skład i budowa zbiorowisk roślinnych oraz metody ich badania. [in:] Szata roślinna Polski. Pod red. W. Szafera i K. Zarzyckiego, PWN, Warszawa 1972, **2**, 271–317.

61. Passarge H., Hoffman G.: Pflanzengesellschaften des nordostdeutschen Flachlandes. II. Pflanzensoziologie **16**, 1–298 (1968).

62. Pyšek P., Pyšek P.: Die Vegetation der Betriebe des östlichen Teiles von Praha. 2. Vegetationsverhältnisse. Preslia **60** (3), 349–365 (1988).

63. Rostański K., Gutte P.: Roślinność ruderalna miasta Wrocławia. Mat. Zakł. Fitosoc. Stos. UW **27**, 167–215 (1971).

64. Rostański K.: *Solidago* L. Nawłoć. [in:] Flora polska. Rośliny naczyniowe Polski i ziem ościennych. Pod red. B. Pawłowskiego i A. Jasiewicz, PWN, Warszawa–Kraków 1971, **12**, 116–121.

65. Sowa R.: Zarys przeglądu roślinnych zespołów ruderalnych Polski. Łódzkie Tow. Nauk. Spraw. z Czynn. i Posiedz. Nauk. **43** (6) 1–11 (1989).

66. Sowa R., Warcholińska U.: Amerykańskie rośliny zielne zadomowione na siedliskach antropogenicznych Polski. [in:] Rośliny pochodzenia amerykańskiego zadomowione w Polsce. Pod red. M. Ławrynowicz i A. U. Warcholińskiej, Łódzkie Tow. Nauk. Szlakami Nauki **19**, 1–180 (1992).

67. Sukopp H.: Neophyten in natürlichen Pflanzengesellschaften Mitteleuropas. Ber. Dt. Bot. Ges. **75**, 193–205 (1962).

68. Święs F.: Zbiorowiska ruderalne i flora synantropijna Sanoka. Ann. Univ. Mariae Curie-Skłodowska, sectio C **40**, 261–273 (1985).

69. Święs F.: Roślinność ruderalna Dęblina. Ann. Univ. Mariae Curie-Skłodowska, sectio C **41**, 89–100 (1986).

70. Święs F.: Charakterystyka geobotaniczna rezerwatu Doły Szczeckie (Wyżyna Lubelska). Ann. Univ. Mariae Curie-Skłodowska, sectio B **42/43**, 203–240 and **1–8** (1987/88).

71. Święs F.: Stosunki geobotaniczne projektowanego rezerwatu krajobrazowo-leśnego Grabowy Las. Ann. Univ. Mariae Curie-Skłodowska, sectio C **43**, 119–146 (1988).

72. Święs F.: Roślinność synantropijna Tarnowa. Ann. Univ. Mariae Curie-Skłodowska, sectio C **44**, 235–270 (1989).

73. Święs F.: Lasy w rejonie leśnictwa Polichna na Wyżynie Lubelskiej. Ann. Univ. Mariae Curie-Skłodowska, sectio C **45**, 249–275 (1990).

74. Święs F.: Roślinność synantropijna miasta Rzeszowa. Wydawn. UMCS, Lublin 1993.

75. Święs F.: A survey of ruderal vegetation in Poland phytocenoses with *Reynoutria sachalinensis* (Friedrich Schmidt Petrop.) Nakai in Mori and *R. japonica* Houtt. Ann. Univ. Mariae Curie-Skłodowska, sectio C **49**, 171–189 (1984).

76. Święs F., Kucharczyk M.: Zbiorowiska ruderalne i elementy flory synantropijnej miasta Tarnobrzega. Ann. Univ. Mariae Curie-Skłodowska, sectio C **37**, 351–375 (1982).

77. Święs F., Piórecki J.: Zbiorowiska ruderalne i flora synantropijna w Jarosławiu. Rocznik Przemyski **24/25**, 356–370 (1986) 1988.

78. Święs F., Urban D.: Roślinność ruderalna i flora synantropijna Rozwadowa, Stalowej Woli i Niska. Rocznik Przemyski **24/25**, 411–444 (1986) 1988.
79. Święs F., Witkowska-Wawer L.: Roślinność synantropijna miasta Przemyśla. Rocznik Przemyski **26**, 273–352 (1988).
80. Święs F., Kwiatkowska M.: Roślinność synantropijna miasta Łukowa. Wydawn. UMCS, Lublin 1996 (mss.).
81. Trzcińska H.: *Rudbeckia* L. Rudbekia. [in:] Flora polska. Rośliny naczyniowe Polski i ziem ościennych. Pod red. B. Pawłowskiego i A. Jasiewicza, PWN, Warszawa–Kraków 1971, **12**, 197–200.
82. Tüxen R.: Grundriss einer Systematik der nitrophilen Unkrautgesellschaften in der eurosibirischen Region Europas. Mitt. Florist.-Sozial. Arb.-Gem. Serie N.F. **2**, 93–175 (1950).
83. Uherčikova E.: Nitrofilné lemové spoločenstva a juchovychodnej časti Malých Karpat. II. Preslia **63** (3–4), 227–244 (1991).
84. Ulmann J.: Die Vegetation des südlichen Maindreieckes. Hoppea 1977, **36** (1), 1–190.
85. Visnak R.: Spolecenstva a celikem kanadskym (*Solidago canadensis* L.) v antropogenni krajine. Preslia **63** (2), 191–304 (1991).
86. Wittenberger G.: Die Steinklee-Goldruten-Gesellschaft bei Offenbach am Main. Beitr. Naturk. Forsch. Südwestdeutschl. **28**, 107–110 (1969).
87. Wittig R.: Die ruderale Vegetation der Münsterschen Innenstadt. Natur. u. Heimat (Münster) **33** (1), 100–110 (1973).
88. Wittig R.: Zur pflanzensoziologischen und ökologischen Stellung ruderaler Bestände von *Solidago canadensis* L. und *Solidago gigantea* Ait. (*Asteraceae*) innerhalb der Klasse *Artemisietea*. Decheniana **131** (1), 33–38 (1978).
89. Żarnowiec J.: Udział i znaczenie diagnostyczne mszaków w zbiorowiskach synantropijnych i pólnaturalnych Oświęcimia. Pracownia Bot. Farmaceutycznej Śląskiej AM w Katowicach (doctoral dissertation, mss). Lublin 1983.

STRESZCZENIE

Badane od kilkudziesięciu lat w Polsce i innych krajach Europy zbiorowiska, między innymi z północnoamerykańskimi gatunkami neofitów, nie mają dotąd ściśle zdefiniowanej rangi ani pozycji w systematyce fitosocjologicznej. Stąd też w niniejszym opracowaniu przedstawiono strukturę syntaksonomiczną i ekologiczną najczęściej opisywanych tego typu zbiorowisk zbudowanych z *Rudbeckia laciniata, Solidago canadensis* i *S. gigantea* na stanowiskach krajowych.

Do tych badań wykorzystano 193 zdjęcia fitosocjologiczne (ryc. 1, tab. 6). Syntetyczne dane o strukturze syntaksonomicznej i ekologicznej charakteryzowanych fitocenoz z wymienionymi północnoamerykańskimi gatunkami neofitów zestawiono w tab. 1–5.

Fitocenozy zbudowane z *Rudbeckia laciniata, Solidago canadensis* lub z *S. gigantea* zaliczane są do kilku odrębnych zespołów lub do bliżej nie określonych fitosocjologicznych podstawowych i podrzędnych zbiorowisk roślinnych. Najczęściej odnosi się to do zespołów *Rudbeckio-Solidaginetum, Rubo-Solidaginetum serotinae* oraz do różnych postaci zbiorowisk z *Solidago canadensis* i *S. gigantea*. Fitocenozy te, stosownie do ich pochodzenia siedliskowego, klasyfikowane są najczęściej w obrębie dwóch ekologicznych grup rzędów

i związków zespołów z klasy *Artemisietea vulgaris* lub z klasy *Epilobietea angustifolii*: typu ruderalnego (rz. *Onopordetalia acanthii*) lub typu półnaturalnego (rz. *Convolvuletalia sepium, Galio-Calystegietalia sepium* lub *Epilobietea angustifolii*).

Obecnie wykazano, że każda z tych fitocenoz zbudowana na przykład z *Rudbeckia laciniata* czy z *Solidago canadensis* lub *Solidago gigantea*, mimo że wywodzi się sukcesyjnie z różnego kręgu siedliskowo-florystycznego, reprezentuje w stadium optymalnego rozwoju tylko jedną konkretną postać zbiorowiska roślin. W rozpatrywanym przypadku odnosi się to do ściśle zdefiniowanych fitocenoz ujętych w randze trzech odrębnych zespołów (*Rudbeckietum laciniatae, Solidaginetum canadensis* i *S. giganteae*) oraz do jednej grupy zbiorowisk zdegradowanego grądu z *Solidago gigantea* (*Tilio-Carpinetum fagetosum, Quercus-Solidago gigantea, Pinus-Rubus hirtus*).

Następnie wykazano, że wymienione trzy zespoły roślin z uwagi na ich sukcesyjne pochodzenie z różnych siedlisk i zbiorowisk roślin należy zaliczyć w obrębie klasy *Artemisietea vulgaris* jedynie do związku *Alliarion* z rz. *Onopordetalia acanthii*. W tej sytuacji należy podkreślić, że jedynie związek *Alliarion* we wszystkich dotychczasowych systemach fitosocjologicznych obejmuje fitocenozy formujące się jednakowo często na różnych siedliskach zarówno ruderalnych, jak i półnaturalnych. Inne natomiast wyższe jednostki fitosocjologiczne spośród roślinności synantropijnej odnoszą się do fitocenoz o wąskiej amplitudzie ekologicznej, np. typu ruderalnego lub półnaturalnego.

Przy tej okazji należy mieć na uwadze i taki fakt, że zw. *Alliarion* wzbogacają w ten sposób nowe gatunki charakterystyczne i nowe fitocenozy zbudowane z tych roślin. Przede wszystkim odnosi się to do następujących gatunków: *Rudbeckia laciniata, R. hirta, Solidago canadensis, S. gigantea, S. graminifolia, Aster salicifolia, A. lanceolatus, A. simplex, A. novi-belgii, A. novae-angliae, Helianthus tuberosus, Erigeron annuus, E. strigosus, Echinocistis lobata, Epilobium adenocaulon, Collomia grandiflora, Lupinus polyphyllus, Impatiens glandulifera, Reynoutria japonica, R. sachalinensis* i *Sambucus nigra*.

Zdefiniowane zespoły — *Rudbeckietum laciniatae, Solidaginetum canadensis, S. giganteae* — posiadają wprawdzie dość bogaty, ale jednocześnie wyjątkowo niejednorodny skład florystyczny. Zasadniczo wymienione zespoły cechują się tylko bezwzględnie dominującymi, a zarazem jedynymi dla nich tak zwanymi charakterystycznymi gatunkami roślin. Są to — dla pierwszego zespołu *Rudbeckia laciniata*, a dla dwóch następnych, kolejno — *Solidago canadensis* i *S. gigantea*.

Stwierdzono również, że zespoły *Rudbeckietum laciniatae* i *Solidaginetum canadensis*, a częściowo i zespół *Solidaginetum giganteae*, nie wykazują na obszarze Polski prawie żadnego wyraźnego zróżnicowania na trwałe, podrzędne jednostki fitosocjologiczne.

Wszystkie trzy zespoły przechodzą kolejne sukcesyjne stadia rozwojowe. W początkowym, inicjalnym stadium rozwojowym przeważnie są one bardzo trudne do wydzielenia od sąsiadujących zbiorowisk roślin. W optymalnym, sukcesyjnym stadium rozwojowym natomiast mogą być wypierane na swych pionierskich stanowiskach przez rozrastające się wśród nich krzewy i drzewa. Stąd też wydzielone w zespole *Solidaginetum giganteae* dwa podzespoły — *S. g. aegopodietosum* i *S. g. rubetosum* — reprezentują w istocie dwa sukcesyjne stadia rozwojowe zespołu: inicjalne — ziołoroślowe i końcowe — zaroślowo-leśno-ziołoroślowe.

Nadto na szczególną uwagę zasługuje scharakteryzowany przypadek nader dynamicznej ekspansji synantropa *Solidago gigantea* na terenie zwartego lasu zdegradowanego grądu *Tilio-Carpinetum*. Zbiorowiska leśne z *Solidago gigantea* reprezentują zupełnie odrębną grupę fitocenoz z kl. *Querco-Fagetea*.