NAT. CROAT. | VOL. 6 | No 4 | 349–366 | ZAGREB | December 31, 1997

ISSN 1330-0520
UDK 581.526.6/.7(497.5/1–191–21)

INFLUENCES OF LAND-USE ON THE STRUCTURE OF RUDERAL VEGETATION IN THE VILLAGE OF LONJA (LONJSKO POLJE NATURE PARK/CROATIA)

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Wattendorf, P.: Influences of land-use on the structure of ruderal vegetation in the village of Lonja (Lonjsko Polje Nature Park/Croatia), Nat. Croat., Vol. 6, No 4., 349–366, 1997, Zagreb

The ruderal vegetation of differently used farmyards in the village of Lonja (Lonjsko Polje Nature Park) was studied. Floristic-structural (species, plant formations) and physiognomic- structural (life forms) characteristics show how changes in the use of former farmyards, for example their abandonment or being used for leisure, influence the ruderal vegetation. It appears, that changes in vegetation structure over a period of 10 to 15 years are much more quantitative than qualitative. Besides this, a new, easy, calculated index for the comparison of the homogeneity of collections of vegetation relevés is presented.

Key words: Ruderal vegetation, life forms, plant formations, land- use, Nature Park Lonjsko Polje, Croatia

Wattendorf, P.: Utjecaj obrađivanja zemlje na strukturu ruderalne vegetacije u selu Lonja (Park prirode Lonjsko Polje), Nat. Croat., Vol. 6, No 4., 349–366, 1997, Zagreb

Istraživana je ruderalna vegetacija različito korištenih seoskih dvorišta u selu Lonja (Park prirode Lonjsko Polje). Floristično-strukturalnim (vrste, biljne zajednice) i fiziognomsko-strukturalnim značajkama (životni oblici) prikazano je kako promjene u načinu korištenja nekadašnjih seoskih dvorišta, npr. napuštanje ili korištenje u rekreativne svrhe, utječe na ruderalnu vegetaciju. Proizlazi da su promjene u strukturi vegetacije u razdoblju od 10 do 15 godina mnogo više kvantitativne nego kvalitativne. Prikazan je i novi, lako upotrebljiv indeks za uspoređivanje homogenosti osnovnih vegetacijskih jedinica.

Ključne riječi: ruderalna vegetacija, životni oblici, biljne zajednice, obrađivanje zemlje, Park prirode Lonjsko Polje, Hrvatska

INTRODUCTION

In the last decades, many characteristic and in the past wide-spread ruderal plant-species have decreased alarmingly throughout the whole of Europe (BRONDE-

Hrvatski prirodoslovni muzej, Demetrova 1, Zagreb, Croatia

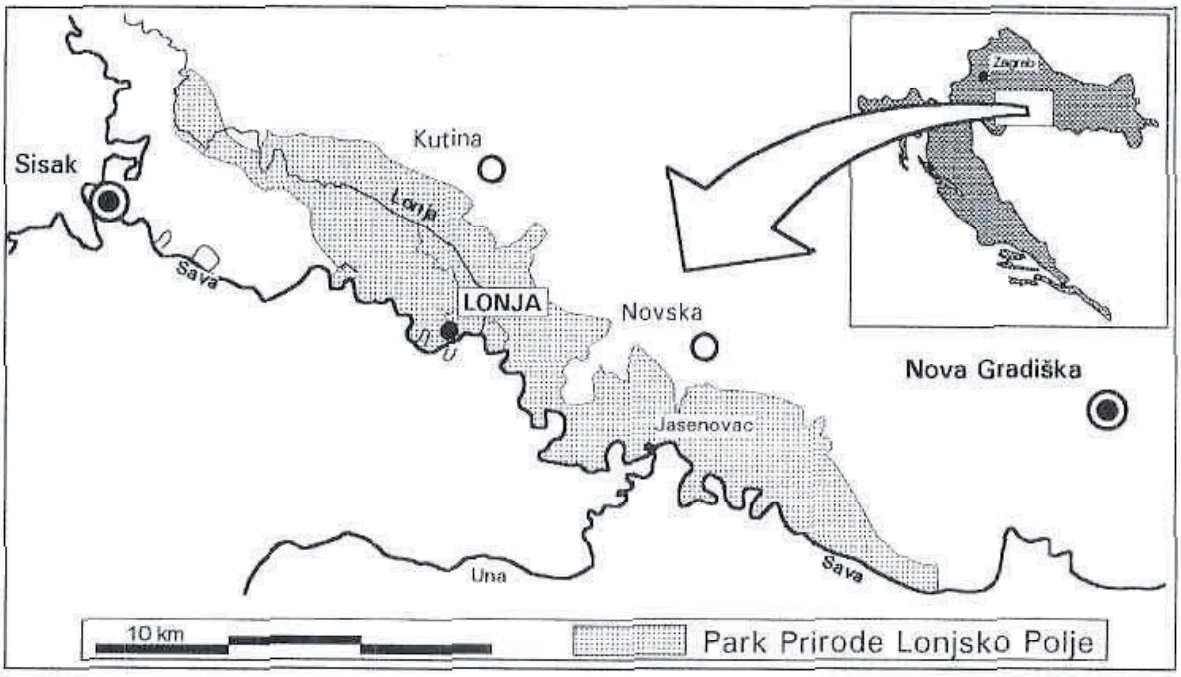

Fig. 1. The situation of Nature Park Lonjsko Polje in Croatia

GARD 1983). This decline is caused mainly by the progressive enclosure of open areas, planting of non-used spaces with ornamental plants and an unregulated development of settlements. The latter has caused the disappearance of historically developed transition zones from villages to their surrounding landscapes, zones which were rich in various structures (SUKOPP 1983). In contrast to this, ruderal plants are omnipresent in most villages of the Lonjsko Polje Nature Park and the development of the ruderal vegetation is mainly determined by the circumstances of the life and work of man and domestic animals.

The village of Lonja (95 m above sea-level) is situated ca. 40 km south-east of Sisak on the north-eastern bank of the Sava river (Fig. 1). It is one of the largest villages in the Lonjsko Polje Nature Park. The whole village is a mosaic of differently used plots, which is a result of a strong decline in population throughout the last decades with many farmyards being abandoned. Because of this, it is well suited for a study of the influences of different kinds of land use on the ruderal vegetation. The basic questions in this paper concern the composition of ruderal vegetation and the effect of land use on its floristic-structural (species, plant formations) and physiognomic-structural (life forms) characteristics.

METHODS

The first step was to list the type and intensity of use of all the plots in the village. Accordingly, land use was classified into five categories (Tab. 1). The second step was to choose in each case two representative plots of every category and to

Table 1. Categories of use

A	Intensive Use	Farm (mainly families)
As well as cattle and pigs, poultry is also kept on these plots. The farm-courts are permanently trodden and used by traffic (tractors, cars).		
B	Extensive Use	Residential plots (mostly single persons)
Cattle are rarely kept on these plots, but always poultry and mainly pigs. Generally, all influences on plant-cover are less intensive than in the first category.		
C	Not used (anymore)	Uninhabited, but still partly maintained
Measures of care are mainly confined to easily reached places.		
D	Abandoned	Abandoned for some (more than ca. 10–15) years
These plots are only seldom or not at all maintained. They are mostly free of any regular human disturbance.		
E	Leisure-Use	Weekend- or holiday-sites
The plots are regularly used for leisure and are »well-kept«.		

record, the vegetation relevés (following BRAUN-BLANQUET 1964) of every plant community. The expansion and arrangement of the plant communities were mapped out on site-plans to a scale of 1:100 or 1:300.

Generally, only wild growing Pteridophyta and Spermatophyta were considered for the evaluation. The calculation of constancy follows KNAPP (1971). The species were grouped according to life form categories after ELLENBERG *et al.* (1991). In the evaluation of plant formations after KORNECK & SUKOPP (1988), centre and main occurence (»Schwerpunkt, Hauptvorkommen«) were equally rated. Subsidiary occurrences (»Nebenvorkommen«) were not taken into consideration, to avoid repeatedly registering the species in too many formations. The calculation of areas (Figs. 5 and 7) is based on the site-plans. For this, the cover-rates of the relevés were transmitted into average percentages (+ = 0,2 %, 1 = 2,5 %, 2a = 7,5 %, 2 = 17,5 %, 3 = 37 %, 4 = 62 %, 5 = 87 %). The cover-rate »r« was omitted in the evaluation of covered areas.

When different collectives of relevés are compared by constancy of species, the cover-rates are not considered. To avoid this deficiency, a simple and easy to calculate »index of homogeneity« (HI) was developed. This index considers presence/absence as well as the cover-rates in all relevés in an adequate way. This calculation of the homogeneity is based on the evenness. The evenness can be calculated (for example after GLAVAC 1996) with the following formula:

$$E = \frac{-\sum p_i \ln p_i}{\ln S} \cdot 100$$

$$p_i = \frac{\text{cover-rate of species } i \text{ in one relevé}}{\text{total of all cover rates}}$$

$$S = \text{total of species}$$

Evenness here is regarded as a measure for diversity (in the sense of »variety« or »different distribution«, HAEUPLER 1982). To consider even the absence of species in one or more relevés, the evenness of cover-rates has to be multiplied by the quotient ascertained by the number of mentions divided by the total number of relevés:

$$HI = E \cdot \frac{n_i}{N}$$

n_i = number of relevés with species *i* present, N = total of relevés

Tab. 2. shows with some examples, how the »index of homogeneity« changes with different dispersion and cover-rates of species.

Table 2. Example: evenness (E) and »index of homogeneity« (HI)

Releve	1	2	3	4	5	6	E	HI
Species A	2	2	2	2	2	2	100	100
Species B	2		2		2	2	100	66,67
Species C	2	2	2	2	1	2	98,66	98,66
Species D	2		2		1	2	97,51	65,01

RESULTS AND DISCUSSION

Influences of use, number of species and constancy

On each plot there are a few typical factors which influence the development of the vegetation in a different way and extent (Tab. 3). Principally, both the number and intensity of them, the essential factors considered, diminish from category A to D. The leisure use plots of category E correspond to those of category B, with the difference that no animals are kept here.

Table 3. Appearance of important use factors which influence vegetation (categories as in Tab. 1)

Category	A	B	C	D	E
Tread	■	◆	●		◆
Driving	■	◆			●
Poultry-keeping	■	■			
Eutrophication	■	◆			●
Hypertrophication	■	●			
Mowing	●	● – ◆	◆	●	■
Other maintenance	● – ◆	●			◆
Storage	◆ – ■	◆	●	●	◆

● : weak, rare ◆ : moderate, on small areas ■ : frequent, intensive, on large areas

The numbers of species on the plots examined and the categories of use are presented in Tab. 4. Inspite of the difference in plot sizes and number of vegetation relevés, the numbers of species found on courts within one category are almost equal. The stock of species on plots in one category however is rather diverse, because about 30 % of species are always found only on one of the plots. This may be caused by the small number of plots examined, because habitat-conditions appearing only once can have distinctive effects on the vegetation of a plot. In total, 208 wild-growing species of Pteridophyta and Spermatophyta were found on the ten plots examined (see species-list in the appendix).

It is true that category-A-farmyards offer a wide range of different micro-habitats to wild-growing plants. These are for example frequently and intensively trodden places, dung-heaps, wet spots near wells or drinking troughs, fowl-pens, pig-pastures or less influenced spots under the shelter of fences and walls and storage-places (for wood, machines, construction material etc.). The intensive use of farmyards and gardens indeed prevents any ruderal plants becoming established on large areas. Approximately half of the open land area is practically not covered with vegetation. Almost undisturbed development is restricted to a few remote spots. Therefore, farmyards in this category do not possess the most species despite having the greatest diversity of habitats.

In category B the largest parts of the yards can be and indeed are populated by spontaneous vegetation. Only tracks and narrow paths or places where poultry is kept are absolutely free of plants. Obviously, larger areas than in category A are available for ruderal plants. The variety of different habitats is somewhat smaller, because the effects of use are less pronounced and their influence on the vegetation is weaker.

In the two following categories no more considerable vegetation-free areas can be found. Category C is still more influenced by human activities than D (view Tab. 3). Usually, annual mowing and occasional treading still create different conditions for growth on much of the plots and prevent the settlement of phanerophytes. As the farmyards were abandoned not so long ago, distinctions among habitat-conditions (e.g. by eutrophication, treading etc.) have not yet entirely disappeared. This and the large areas available for spontaneous vegetation may be the reasons for the highest species-rates of all categories (Tab. 4).

Category D exhibits the lowest number of species. Former use shows no more effects, and homogeneous conditions of growth can be found on these mostly un-

Table 4. Numbers of species on the ten plots and total in every category

Category	A	B	C	D	E
Plot 1	67	79	81	63	73
Plot 2	66	83	75	50	67
Total	96	106	107	80	95

disturbed plots. Above all the emergence of *Sambucus nigra* over large areas, and the decline of plants typical of trodden places, reduce the numbers of species on the abandoned farmyards. Plots in category E are also totally covered with plants; the influences of the various uses found in A and B are, however, mainly absent. The factors thet have the most influence on vegetation are moderate treading and

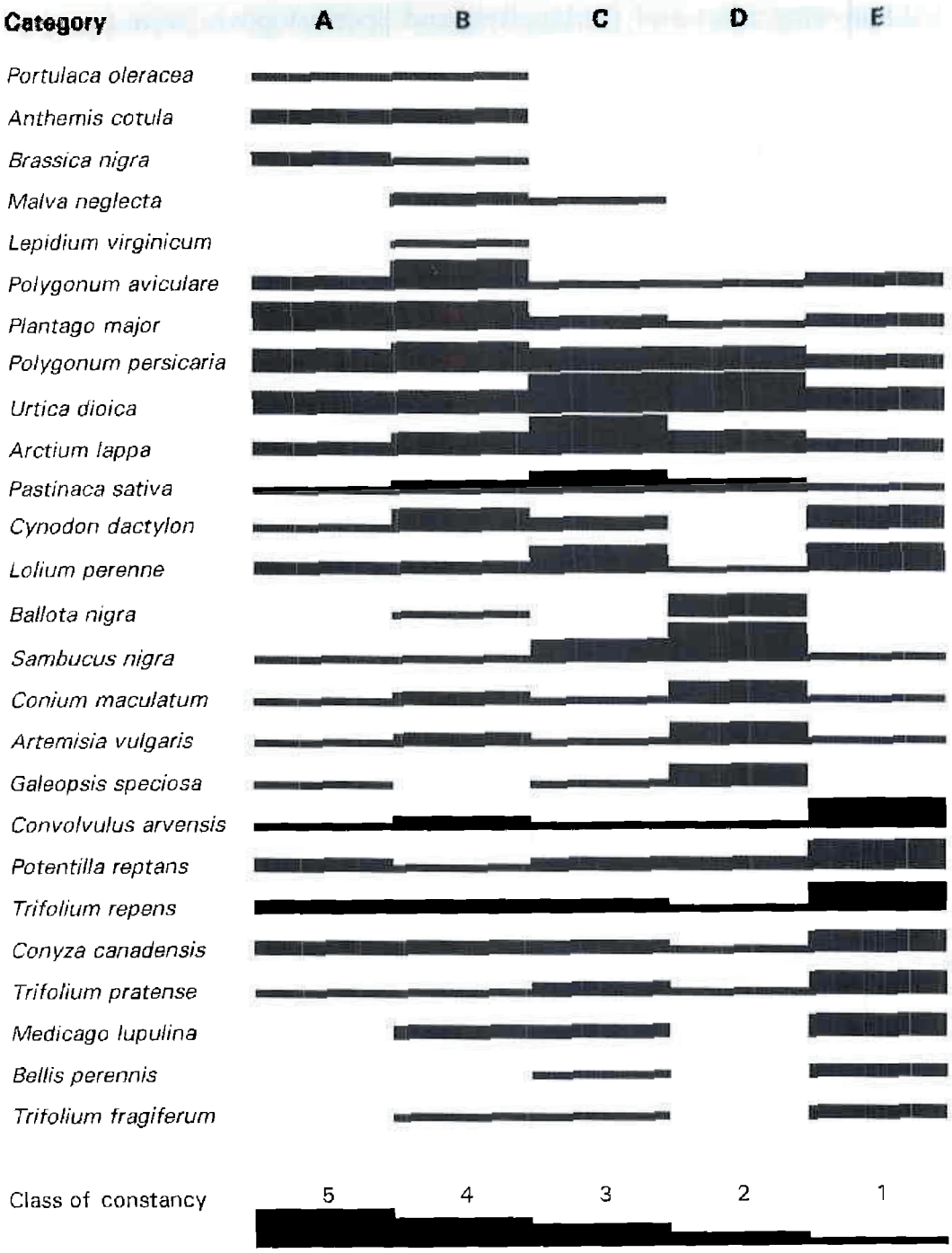

Fig. 2. Constancy of some characteristical species

frequent mowing, which is usually practised, in contrast to the other categories, with lawn-mowers. Never the less, on these plots remote spots are found, where fringes of high- growing perennial plants can develop undisturbed. This is the only reason why the numbers of species here, do not differ essentially from those in the other categories.

The constancy in the occurence of species can be seen as a characteristic of the growth-conditions in the five categories and also allows us to evaluate the homogeneity of the habitats. The more equal the growing conditions on the area of one plot are, the more equal the relevés of this plot must be. Fig. 2 shows the classes of constancy of some typical species. Typical plants of frequently disturbed ruderal sites with open soils, such as *Portulaca oleracea, Anthemis cotula* and *Lepidium virginicum* can be found mainly in categories A and B. Species restitant to treading, e.g. *Polygonum aviculare* and *Plantago major* appear almost everywhere, but their main occurence is also in A and B. *Cynodon dactylon*, a pioneer plant on open sites, requiring light, sandy soils, is missing only in category D. In this category even *Lolium perenne* is not very constant. But in contrast to the annual plants of trodden places this perennial species, which is resistant to trampling and mowing, occurs mainly in categories C and E.

In all categories forbs such as *Urtica dioica, Polygonum persicaria, Arctium lappa* or *Pastinaca sativa* occur. The particular species however have a rather different distribution. *Urtica dioica*, a high growing perennial forb-species, has its optimal occurences in C and D, where it is not disturbed or destroyed by trampling, cattle or mowing. In category D it is still frequent because of its indifferent light requirements. In contrast, the constancy of the light-requiring forb-species *Arctium lappa* and *Pastinaca sativa* increases from category A to C and then decreases from C to E. These species can find optimal growing-places on unused plots, while their higher light- requirements are not satisfied in the mainly bush-coverered category D. The occurence of bushes in A, B and E is limited only to some less disturbed spots. Single juvenile specimens however, can be found in many forb stands in every category. *Sambucus nigra* is present in almost every relevé (92 %) in category D. Characteristic species of category E are those of nutrient-rich meadows or pastures such as *Trifolium repens* and *T. pratense, Potentilla reptans, Bellis perennis* and *Medicago lupulina*. These species are found rarely or not at all in category D.

The calculation of constancy only considers the presence/absence of species and not the area covered. Because of this, an »index of homogeneity« (HI) was developed to test how uniform species occur in the sample of relevés of one category. Fig. 3 shows the ranges of HI-values of all species in one category. Species occuring only once can not be considered, because no evenness-value is available. Because of this, the percentage of these species is shown at the top of every column. Low and medium values (median, 25 %- and 75 %-quartil) of categories do not show distinct differences, a slight increase of medians (and 25 %-quartil) from A to D and E can be noticed. Only maximal values vary over a wider range. The largest uniformity in the occurrence of species in category C (*Arctium lappa*: 82,7) and D (*Sambucus nigra*:

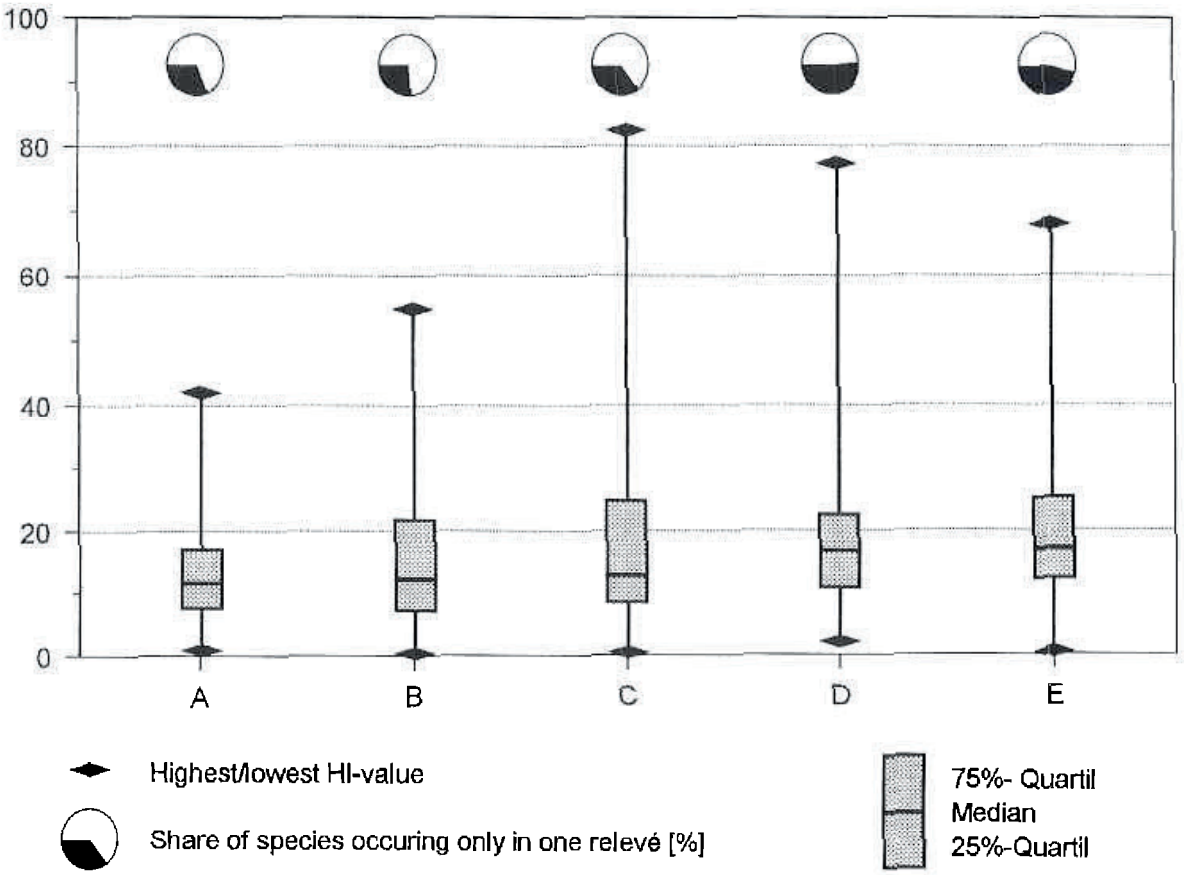

Fig. 3. »Indices of homogeneity« of species in the categories A–E.
The share of species, which only occur in one relevé is between 26 and 52 %.

77,1) indicates relative homogenous growing conditions. The largest share of species (52 %) in category D indeed occurs only in one relevé. This need not be contradictory to the above, because characteristically most of these species are ruderal (e.g. *Plantago major, Polygonum aviculare, Urtica urens*) or pasture or meadow plants (e.g. *Poa trivialis, Trifolium pratense*), therefore »relicts« of a former use. Only a few species already represent further stages of succession, such as *Quercus robur*. On the whole, the disappearance of the most important influencing factors, which goes hand in hand with the abandoning of the plots (Tab. 3) and the resulting levelling of growing conditions, does not as yet have a discernible effect on the homogeneity of the relevés.

Life forms

The classification of plant life forms, as is well known, is based on the sort of resting organs that a plant posesses. From this, additional characteristics can be deduced which are of particular consequence for the survival of plants on ruderal growing places. These characteristics are especially sensitivity to treading, cattle feeding or mowing.

Diaspores are very resistant and survive in the soil, being able temporarily to endure extremely unfavourable conditions, which no perennial plant could withstand. Therophyta can therefore exist in extreme growing places. However they can exist for longer periods only in places with favourable conditions for germination, especially where the perennial vegetation is repeatedly disturbed or destroyed. Perennial plants do not have to pass the sensitive phase as seedlings every year. They build vigorous and far-reaching root- systems, woody plants even shoot-systems, constructed for a longer lifetime, which cost them considerable amounts of substance. Hemicryptophyta with above or under ground growing runners often occupy trodden and frequently disturbed growing-places leading from the edges. On such spots seedlings or sensitive young plants can hardly survive. Chamaephyta are sensitive to mechanical irritations in every phase of their lives because of their perennial sprouts. Nano-Phanerophyta and Phanerophyta, which need rather long times without disturbance for their development, are less important members of ruderal vegetation. After some years of undisturbed development, they can successfully compete for light and nutrients because of their extension in height as well as in depth, and so supercede herbaceous plants.

Fig. 4 shows the distribution of life forms in the five categories. Hemicryptophyta are represented with the highest number of species, followed by therophyta with various margins. Their share decreases insignificantly from A to D. The less often places stay undisturbed, the less these plants can find spots without vegetation, where they can easily establish themselves. More and more perennial plants occupy these places and overgrow and supercede annual plants. The only wild-growing phanerophyte occuring is *Quercus robur* in category D, which is not considered in Fig. 4.

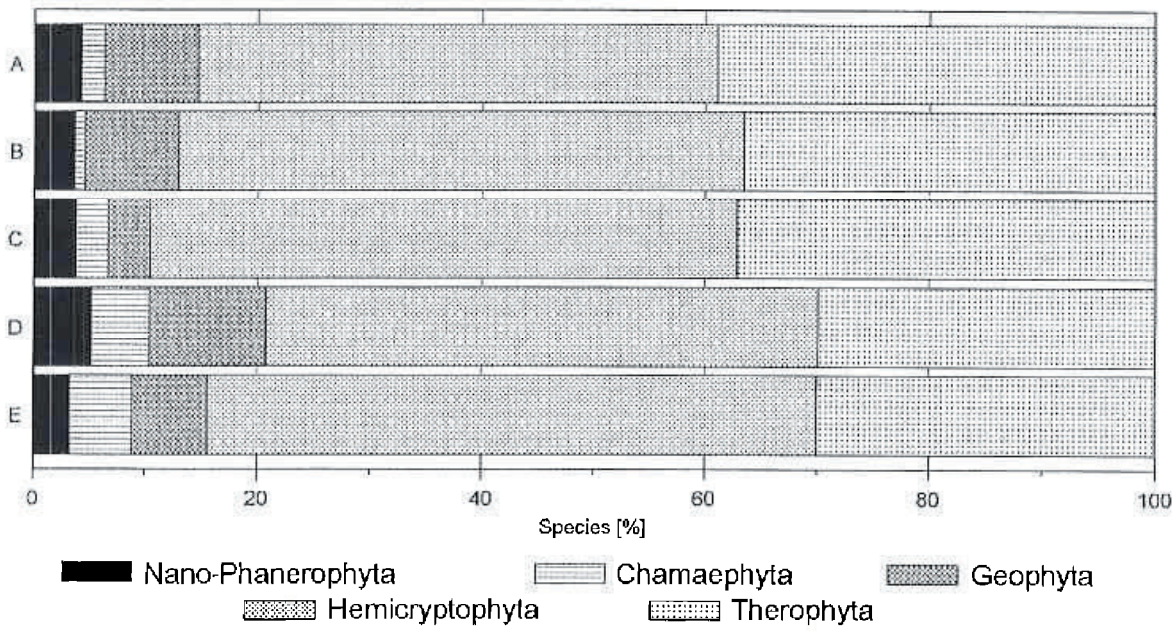

Fig. 4. Percentage shares of different types of life forms

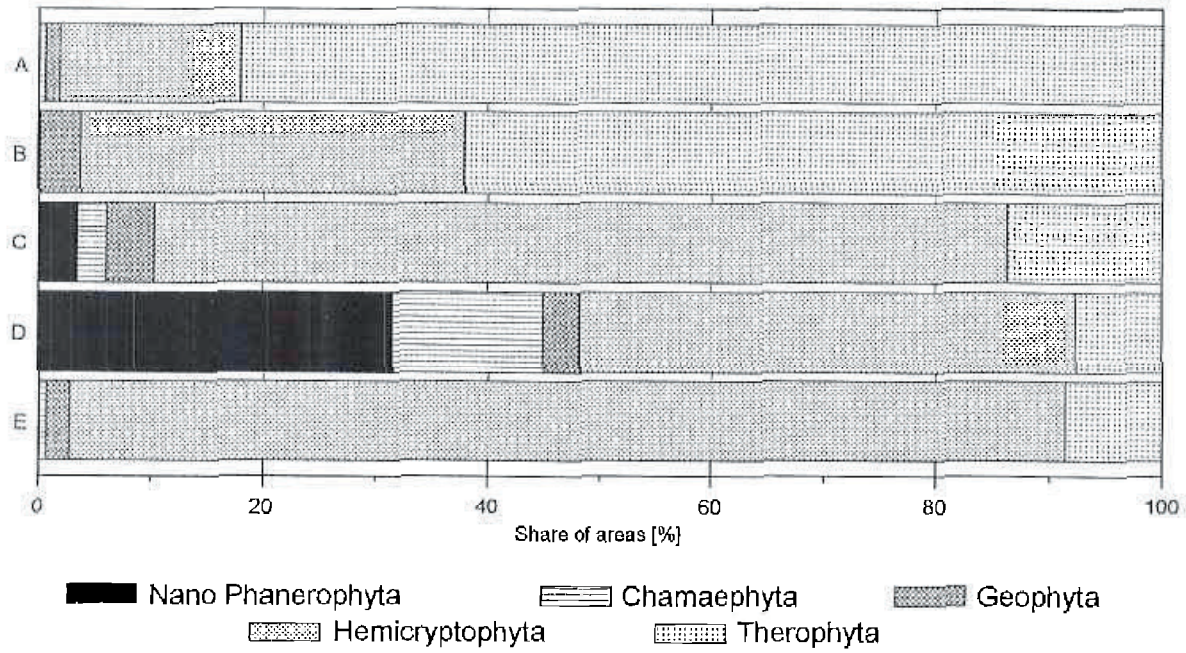

Fig. 5. Areas covered by different types of life forms (shares 1 % are not indicated, just as chamaephytes which cover in all categories 1–2 % of the area.)

The distribution changes if, as shown in Fig. 5, the areas covered by the species (expressed as a percentage) are taken into consideration: in category A the proportion of therophyta and hemicryptophyta is inverted, which means that therophyta cover by far the largest areas. Even in category B, where many more hemicryptophyte-species occur, they cover a smaller percentage share of area than the therophyta. Categories A and B differ because of this from all others, because frequently disturbed growing places offer chances for the establishment of annual species. In category C, D and E perennial species are predominant and also cover the largest areas. More than 30 % of the area of category D is covered by woody plants, almost exclusively *Sambucus nigra*. Phanerophyta share, with less than 1 %, shows that up to the present the immigration of trees is not of importance. In all other categories, phanerophyta do not occur at all. The very high share of area covered by chamaephyta in D is almost exclusively caused by *Hedera helix*, which is found in the shadow of trees and shrubs in abandoned orchards.

Formations

On the examined plots, plants from 22 of the 24 formations (after KORNECK & SUKOPP 1988) occur, but only 9 formations are represented with a share of more than five percent of species or area covered.

The most important difference in the formation spectra (Fig. 6) is that in category C, D and E more woodland plants (formations 21 and 22) than in A and B can be

found and only in category A do plants of Bidens-communities (»Zweizahngesellschaften«) occur with an appreciable share. Farm-courts of this category offer good growing-conditions for these plants around dung-heaps or similarly damp or wet eutrophic spots.

Another picture of the differences in formation spectra can be gained if the areas covered are again taken into consideration (Fig. 7): The shares of short-lived ruderal vegetation (»Ackerunkraut- und kurzlebige Ruderalvegetation«) and plants of trodden spots (»Kriechpflanzen- und Trittrasen«) diminish steadily from A to D. In category E they are as high as in B. In category D the shares of the area covered by plants from formations 6, 8, 9, 15 and 16 dropped below 5 %, in favour of nitrophilic forb vegetation (»Nitrophile Staudenvegetation«) and woodland-formations, even though the species are mostly still present. As mentioned before, forbs with high nutritive requirements occur in category E, but they are limited to marginal growing-places and have only small shares of the area.

On the whole, it turns out that larger areas in the village can be colonized by ruderal plants if plots are abandoned or used for leisure. But over the long term, these areas will not be settled by ruderal species but rather by woodland or meadow plants.

A comparison of Figs. 6 and 7 shows that, with diminishing use, the succession has only led to a decrease in the area covered by plants of a certain formations and not to their entire disappearance. This development can already be seen if the spectra of life forms (Figs. 4 and 5) are compared. The change in the floristic and physi-

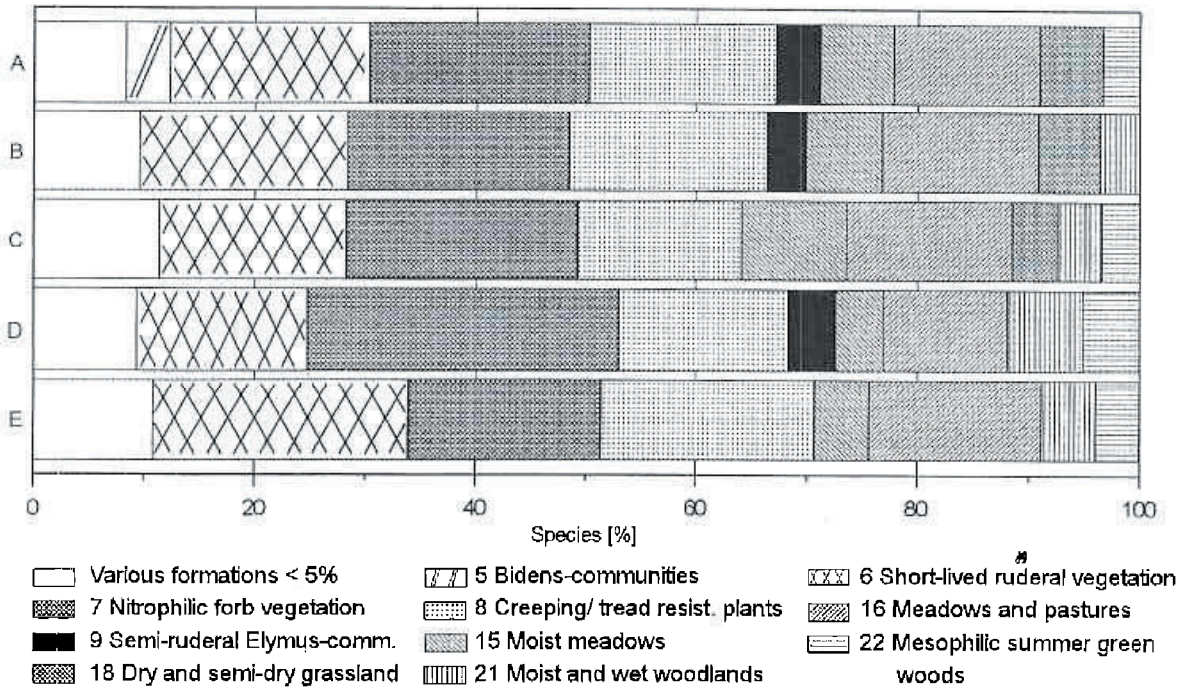

Fig. 6. Percentage shares of different formations in the categories of use

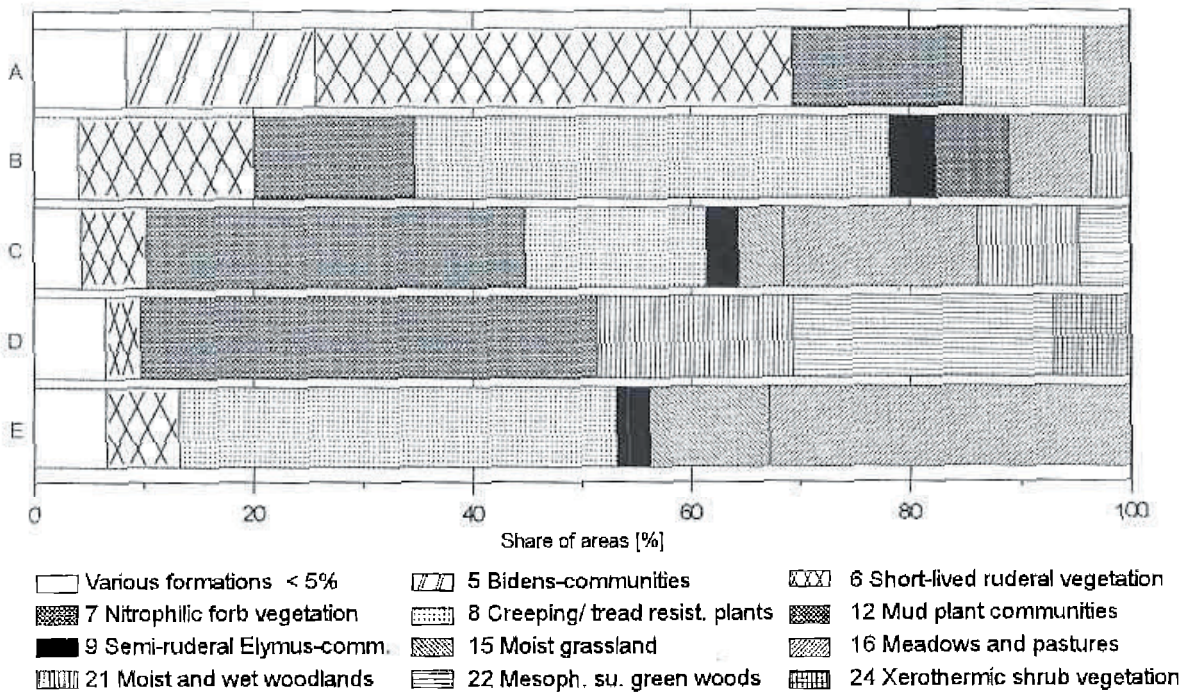

Fig. 7. Areas covered by different formations in the categories of use

ognomic structure of vegetation is therefore, at least until now, more quantitative than qualitative. Furthermore it turns out, that succession-processes below a certain margin can only be recognized, if quantitative aspects are duly taken into consideration.

ACKNOWLEDGMENTS

I would like to thank Prof. Dr. W. Konold for all his help, suggestions and support throughout the past years.

Received June 30, 1997

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List of species

Plant nomenclature follows mainly OBERDORFER (1990) and, if species are not mentioned there, JAVORKA & CSAPODY (1979).

Achillea millefolium L.
Aegopodium podagraria L.
Agrostis stolonifera L.
Alliaria petiolata (M. B.) Cav. et Gr.
Alopecurus pratensis L.
Althaea officinalis L.
Amaranthus blitum L.
Amaranthus patulus Bert.
Amaranthus retroflexus L.
Ambrosia artemisiifolia L.
Anagallis arvensis L.
Angelica sylvestris L.
Anthemis cotula L.
Arctium lappa L.
Arctium minus L.
Aristolochia clematitis L.
Armoracia rusticana G. M. Sch.
Arrhenatherum elatius (L.) P. B. ex J. et C. Presl
Artemisia verlotiorum Lamotte
Artemisia vulgaris L.
Asplenium trichomanes L.
Ballota nigra L.
Bellis perennis L.
Bidens frondosa L.
Bidens tripartita L.
Brassica napus L.
Brassica nigra (L.) Koch
Bromus racemosus L.
Bromus squarrosus L.
Capsella bursa-pastoris (L.) Med.
Cardamine pratensis L.
Carduus acanthoides L.
Carex hirta L.
Carex otrubae Podp.
Carex remota L.
Carex spicata Huds.
Carex vulpina L.
Carpesium wulfenii Schrk.
Centaurea nigrescens Willd.
Cerastium glomeratum Thuill.
Cerastium holosteoides Fr. em. Hyl.
Chelidonium majus L.
Chenopodium album L.
Chenopodium ficifolium Sm.
Chenopodium glaucum L.
Chrysanthemum leucanthemum L.
Chrysanthemum vulgare (L.) Bernh.

Cichorium intybus L.
Circea lutetiana L.
Cirsium arvense (L.) Scop.
Conium maculatum L.
Convallaria majalis L.
Convolvulus arvensis L.
Convolvulus sepium L.
Conyza canadensis (L.) Cronq.
Cornus sanguinea L.
Corylus avellana L.
Crataegus laevigata (Poir.) D.C.
Crataegus monogyna Jacq.
Crepis biennis L.
Crepis capillaris (L.) Wallr.
Cucubalus baccifer L.
Cynodon dactylon (L.) Pers.
Dactylis glomerata L.
Datura stramonium L.
Daucus carota L.
Digitaria sanguinalis (L.) Scop.
Dipsacus sylvestris Huds.
Echinochloa grus-galli L.
Echinocystis lobata (Michx.) Torr. et Gray
Elymus caninus L.
Elymus repens (L.) Gould
Epilobium tetragonum L.
Epilobium parviflorum Schreb.
Erigeron annuus (L.) Pers.
Euonymus europaeus L.
Festuca gigantea (L.) Vill.
Festuca pratensis Huds.
Fraxinus angustifolia Vahl
Galeopsis pubescens Besser
Galeopsis speciosa Mill.
Galinsoga parviflora Cav.
Galium aparine L.
Galium mollugo L.
Galium verum L.
Geranium dissectum Jusl.
Geranium molle L.
Geum urbanum L.
Glechoma hederacea L.
Hedera helix L.
Humulus lupulus L.
Hypericum perforatum L.
Hypericum tetrapterum Fries.
Juncus articulatus L.
Juncus compressus Jacq.
Juncus effusus L.
Juncus tenuis Willd.
Lactuca serriola L.
Lactuca virosa L.
Lamium hybridum Vill.
Lapsana communis L.
Lathyrus tuberosus L.
Leersia oryzoides (L.) Schwartz
Leontodon autumnalis L.
Leonurus marrubiastrum L.
Lepidium virginicum L.
Ligustrum vulgare L.
Lolium perenne L.
Lotus corniculatus L.
Lycopus europaeus L.
Lycopus exaltatus L.
Lysimachia nummularia L.
Malva neglecta Wallr.
Malva pusilla Sm.
Malva sylvestris L.
Matricaria discoidea DC.
Matricaria recutita L.
Medicago lupulina L.
Medicago sativa L.
Melandrium album (Mill.) Garcke
Melilotus alba Med.
Mentha arvensis L.
Mentha aquatica L.
Mentha longifolia (L.) Huds
Mentha pulegium L.
Myosotis arvensis (L.) Hill.
Myosoton aquaticum (L.) Moench.
Oenanthe banatica Heuff
Oenanthe silaifolia M. Bieb.
Ononis spinosa L.
Oxalis fontana Bunge
Pastinaca sativa L.
Phleum pratense L.
Plantago intermedia Gilib.
Plantago lanceolata L.

Plantago major L.
Poa annua L.
Poa pratensis L.
Poa trivialis L.
Polygonum amphibium L.
Polygonum aviculare L.
Polygonum convolvulus L.
Polygonum lapathifolium L.
Polygonum mite Schrank
Polygonum persicaria L.
Portulaca oleracea L.
Potentilla anserina L.
Potentilla reptans L.
Potentilla supina L.
Prunella vulgaris L.
Prunus cerasifera Ehrh.
Pulicaria vulgaris Gaertn.
Quercus robur L.
Ranunculus acris L.
Ranunculus repens L.
Ranunculus sardous Crantz
Rhinanthus serotinus (Schönh.) Oborny
Rorippa austriaca (Crantz) Bess
Rorippa sylvestris (L.) Besser
Rosa canina L.
Rubus caesius L.
Rubus fruticosus L.
Rumex conglomeratus Murr
Rumex crispus L.
Rumex longifolius D. C.
Rumex obtusifolius L.
Rumex patienta L.
Salix alba L.
Sambucus ebulus L.
Sambucus nigra L.
Saponaria officinalis L.
Scrophularia nodosa L.
Senecio jacobaea L.
Senecio vulgaris L.
Setaria pumila (Poiret) R. et Sch.
Sisymbrium officinale (L.) Scop.
Solanum dulcamara L.
Solanum luteum Mill.
Solidago canadensis L.
Solidago gigantea Ait.
Sonchus asper (L.) Hill
Sonchus oleraceus L.
Stachys palustris L.
Stellaria holostea L.
Stellaria media (L.) Vill.
Symphytum officinale L.
Taraxacum officinale Wiggers
Torilis arvensis (Huds.) Lk.
Torilis japonica (Houtt.) D. C.
Trifolium campestre Schreb.
Trifolium fragiferum L.
Trifolium hybridum L.
Trifolium pratense L.
Trifolium repens L.
Ulmus minor Mill.
Urtica dioica L.
Urtica urens L.
Verbena officinalis L.
Veronica agrestis L.
Veronica anagalloides Guss.
Veronica arvensis L.
Veronica chamaedrys L.
Veronica polita Fr.
Veronica serpyllifolia L.
Vicia cracca L.
Vicia dasycarpa Ten.
Vicia sativa L.
Xanthium italicum Morr.

SUMMARY

Influences of Land-use on The Structure of Ruderal Vegetation in the Village of Lonja (Nature Park Lonjsko Polje/Croatia)

P. Wattendorf

The ruderal vegetation of differently used farmyards in the village of Lonja (Nature Park Lonjsko Polje/Croatia) was studied. These farmyards were devided into five categories (A: intensive use (farm), B: extensive use (residential plot), C: not used (any more), D: abandoned, E: leisure use) and the vegetation was surveyed by relevés and mapped. It is shown by floristic-structural (species, plant formations) and physiognomic-structural (life forms) characteristics how changes in the use of former farm-courts, e.g. abandoned or leisure use, influence the ruderal vegetation. It appears that changes in vegetation structure over a period of about 10 to 15 years are much more quantitative than qualitative. That is to say, differences in the vegetation of the five categories can be seen much more by the share of areas covered by the species than by the presence or absence of species.

In total 208 species of pteridophyta and spermatophyta were found on the ten examined plots in the five categories. Due to different influences of use on the vegetation, the total numbers of species in one category differ in a range between 80 in category D, about 95 in A and E and over 100 in B and C. Some of these species characterize well the conditions of growth in a certain category with their distribution.

The gradual disappearance of the most important influencing factors (from category A to D) goes hand in hand with the abandoning of the plots. With a newly developed »Index of homogeneity« it was found that the assumed levelling of growing conditions due to the above does not as yet have a discernible effect on the homogeneity of the relevés of a category.

Only on intensively used farmyards (cat. A) can therophyta cover the main shares of areas. In all other categories, hemicryptophyta predominate except on abandoned plots (cat. D), where nano – phanaerophyta also cover large areas. Chamaephyta cover considerable areas only in categories C and D, while geophytes are approximately equally represented in all categories.

Members of the formations »Bidens-communities« (»Zweizahngesellschaften«) and »field-weed and short-lived ruderal vegetation« («Ackerunkraut- und kurzlebige Ruderalvegetation«) cover the largest shares in intensively used farmyards. On plots which are not used anymore or have been abandoned »nitrophilic forb vegetation« (»Nitrophile Staudenvegetation«) and different woodland formations cover larger areas. Most typical of leisure use plots are species of frequently trodden places (»Kriechpflanzen und Trittrasen«) as well as those of meadows or pastures (»Frischwiesen und Weiden«).

In the village of Lonja the abandonment of plots has led to an increase in the area available to wild plants, but in the long term, it seems that these areas will be covered mainly by woodland plants and not by ruderal species. On leisure use plots, ruderal vegetation has been displaced in favour of the vegetation of frequently trodden meadows and, above all, mown turfs.

SAŽETAK

Utjecaj obrađivanja zemlje na strukturu ruderalne vegetacije u selu Lonja (Park prirode Lonjsko Polje)

P. Wattendorf

Istraživana je ruderalna vegetacija različito korištenih seoskih dvorišta u selu Lonja (Park prirode Lonjsko Polje/Hrvatska). Ona su bila podijeljena u pet kategorija (A: intenzivno korištenje farma, B: povremeno korištenje okućnica, C: ne koristi se (više), D: napuštena, E: korištenje u rekreativne svrhe), a vegetacija je istraživana pomoću osnovnih terenskih jedinica i kartirana. Floristički-strukturalnim (vrste, biljne zajednice) i fiziognomsko-strukturalnim značajkama (životni oblici) prikazano je kako promjene u načinu korištenja nekadašnjih seoskih dvorišta, npr. napuštanje ili korištenje u rekreativne svrhe, utječe na ruderalnu vegetaciju. Proizlazi da su promjene u strukturi vegetacije u razdoblju od 10 do 15 godina mnogo više kvantitativne nego kvalitativne. To znači da se razlike između pet vegetacijskih kategorija očituju mnogo više u udjelu površina pokrivenih vrstom, nego nazočnošću ili nenazočnošću vrste.

Ukupno 208 vrsta papratnjača i sjemenjača zabilježeno je na deset istraživanih ploha u pet kategorija. Zbog različitih utjecaja korištenja na vegetaciju, ukupan broj vrsta varira u rasponu od 80 za kategoriju D, oko 95 za A i E i preko 100 za B i C. Neke od tih vrsta svojim rasprostranjenjem odgovaraju uvjetima rasta određene kategorije.

Postupni nestanak najvažnijih faktora utjecaja (od kategorija A do D) usporedan je s napuštanjem zemljišta. Pomoću novog »Indeksa homogenosti« ustanovljeno je da takvi uvjeti do sada nisu imali vidljive učinke na homogenost osnovnih jedinica pojedinih kategorija.

Samo na intenzivno korištenim seoskim dvorištima (kat. A) terofiti mogu pokrivati većinu površine. U svim ostalim kategorijama dominiraju hemikriptofiti, osim na napuštenim plohama (kat. D), gdje nano-fanerofiti mogu također pokrivati velike površine. Hamefiti pokrivaju znatnije površine samo u kategorijama C i D, a geofiti su otprilike ravnomjerno zastupljeni u svim kategorijama.

Članovi »Bidens-zajednica« i »korovne i kratkoživuće ruderalne vegetacije« pokrivaju najveće površine na intenzivno korištenim seoskim dvorištima. Na plohama koje se više ne koriste ili su napuštene, velike površine pokriva »nitrofilna vege-

tacija trajnica« i različiti oblici šumske vegetacije. Najtipičnije vrste na površinama korištenim za rekreativne svrhe su vrste često gaženih staništa, kao i livada i pašnjaka.

U selu Lonja napuštanje ploha dovelo je do povećanja površine dostupne nekultiviranim vrstama, ali će, dugoročno gledano, sve te površine biti prekrivene uglavnom šumskim, a ne ruderalnim vrstama. Na površinama korištenim u rekretivne svrhe ruderalna vegetacija ustupila je mjesto vegetaciji gaženih livada, ponajviše često košenih travnjaka.