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QUERCUS CERRIS L. WITH THE SELF COMPANION OF THE HIGHER VEGETATION IN NATIONAL NATURAL RESERVATION THE PATIANSKA CERINA

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ABSTRACT

Quercus cerris L. is a woody plant of Europe and the adjoining Asia Minor. Under Slovakian conditions it thrives in southwestern and southern Slovakia where it forms natural coenoses and maintains its dominant position. The National Nature Reservation Patianska cerina is one of such places. The above oak form a two-stage canopy there, with the tallest trees reaching up to 32 meters in height at the age of about 200 years, while at the lower stage it is dominated by *Acer campestre* L., *Crataegus monogyna* Jacq. and *Acer tataricum* L. The herbal synusia is absolutely dominated by *Impatiens parviflora* DC. in its vernal aspect. This coenose belongs predominantly to B/C line and to *Carpineto – Quercetum acerosum* (sense Zlatník, 1959) forest type. The soil type represents illimerized soils on loess.

Key words: natural conditions, Quercus cerris and higher vegetation, soil, National Nature Reservation Patianska cerina.

INTRODUCTION

The oak *Quercus cerris* L. has good conditions for its existence in the warm regions of SW and Slovakia in the first vegetation floor (sensu Zlatník 1959). It thrives best in nutrient row B (Zlatník 1959) in *Carpineto* and *Quercetum* group of forest type. The National Nature Reservation (NNR) Patianska cerina was established for the purpose of a better understanding of this type of oak forests and particularly of *Q. cerris* oak tree. It dates from 1927 (Státny pozemkový úrad 1927, 1932). Its recent legislation was specified by Act No. 287/1994 National Code, where NNR represents the highest degree of nature conservation in Slovakia. This paper describes the present coverage of woody plants, grasses and herbs there, which can be considered an important contribution to the development and present condition of the NNR. In addition to *Q. cerris* the co-existing woody plants and herbal synusia are of interest too, in their adaptation to the changing qualities of *Q. cerris* stand as a result of changes in age, height, in-growing and canopy.

METHOD

The intention of the paper is to describe the coverage of *Q. cerris* and the co-existent woody plants, their vertical stratification, herbal synusia, stand situation and natural conditions. Vertical classification of woody plants has been made sensu Konšel et Zlatník (Randuška, Vorel, Plíva 1986): 1 – overgrowing trees; 2 – level trees; 3 – in-growing trees and shrubs; 4 – sub-level trees and shrubs; 5.1 – trees and shrubs up to 1.3 m height; 5.2 – seedlings.

Categories 1–4 on the whole present 100% woody plants with partial stratification, cate-

gories 51 and 52 hold for the system of Zlatník's school. Herbal synusia is recorded using quantification sensu Zlatník (1959): this quantification has been used in the mapping of all Slovakian forests. Soil typology conforms with the regulations of the Central Forestry Institute (1975). The front of the soil sound was 0,50 m in width, 1,00 m in depth. The nomenclature of relief formations was adopted from a detailed typological mapping of forest types in accordance with the Forest Project /Lesoprojekt (1992). The vertical span of Patianska cerina altitude was measured by a Paulin aneroid with 1 m accuracy. Geological substratum was determined in accordance with Kuthan et al. (1963). The perimeter of the thickest *Q. cerris* trees was measured using a tailor meter tape, tree height by a Blumeleiß height gauge.

Tree age was ascertained using the materials of the Forest Economy Plan, investigating decayed trees and by a Presler auger on living trees. Orographical classification was according to Lesoprojekt (1992). Latin and Slovak nomenclature according to Červenka et al. (1986). Climatic data were adopted from the Climatic Atlas (Atlas podnebia ČSR, Syrový 1958). Precipitation and temperatures represent mean values for the years 1901–1950. Wind conditions were adopted from the nearest meteorological station (Levice) for the years 1946–1953.

RESULTS

Location and natural conditions:

The National Nature Reservation Patianska cerina is located (480° 18′ 44″ northern latitude and 180° 21′ 50″ northern longitude) in the geomorphological system of the Danubian Hilly Country (Podunajská pahorkatina), division Hron Hilly Country (Hronská pahorkatina), subdivision Beša Hilly Country (Bešianska pahorkatina). Its altitude ranges between 160 and 220 m above sea level. The territory is drained by the brooks Pata and Telinský potok (Fig. 1), the latter flowing into the river Žitava at the town of Vráble. The Žitava belongs to the water basin of the rivers Nitra-Váh-Danube. The NNR is located on a flat hill ridge with a NE-SW orientation and adjacent eastern macroexposition on a moderately vertically undulated slope. Bordering on the reservation from the eastern side is a former manor house,

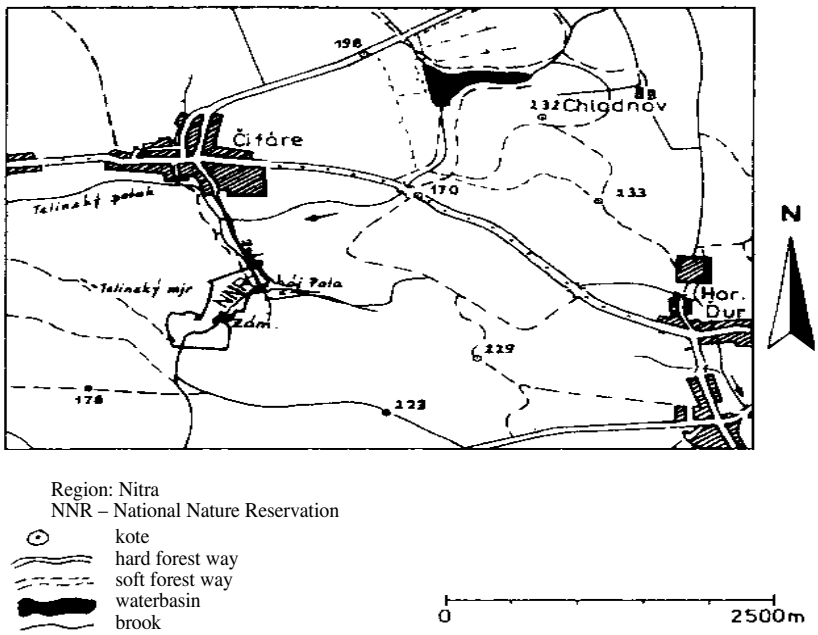

Fig. 1. Orientation sketch of the localization of the National Nature Reservation Patianska cerina.

now serving as a School in the Nature. The closest village is Čifáre (Fig. 1, adopted from Kasalová 1977). The local name of the area is Pata. Current forestry maps covering also the situation in the year 2000 (Lesoprojekt 1991) present it as forest stands 250a, b, c, 251, 252a, b (Fig. 2). Total reservation area is 29.55 hectares (Oblastný úrad 1998). The locality belongs to the cadastre of the village Vel'ký Ďur in the district of Levice (year 2000). According to the Walter climatogram (sensu Walter et al. 1975) the NNR locality do not suffer from draught periods (Fig. 3). The wind rosette (Fig. 4) shows that the locality mostly has NW air circulation, followed by E, W and SE, the least frequent being S air circulation. Concerning the intensity of circulation according to the Beaufort scale, in the grade 1 (breeze) is the E circulation most frequent, in the Grades 2–4 (slender, mild, rather fresh wind) NW circulation, similarly it is in Grade 5 and high (fresh wind and more).

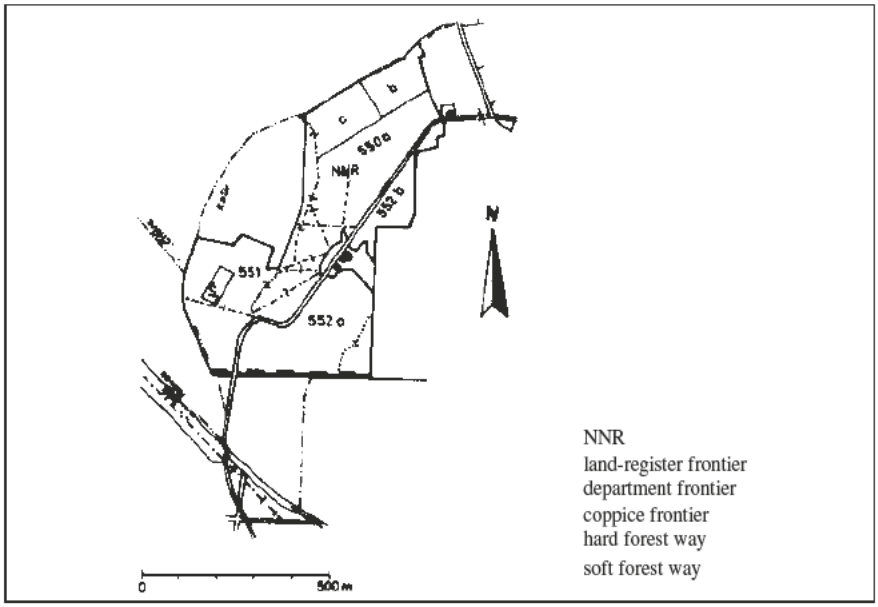

Fig. 2. A detail of the NNR Patianska cerina according to tree stands up to the year 2000.

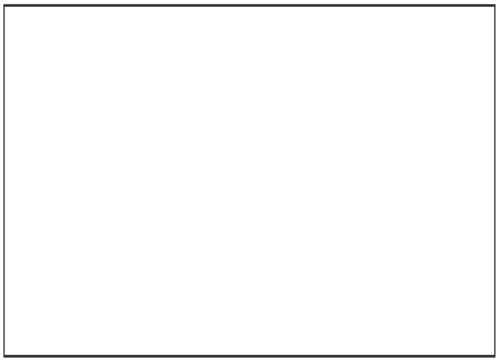

Fig. 3. Walter climatogram showing weather conditions in the NNR Patianska cerina for the years 1901–1950.

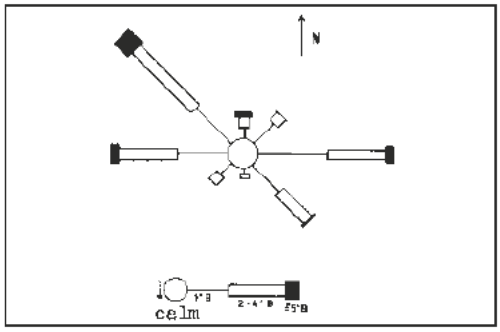

Fig. 4. Wind rosette showing wind intensity and direction in the NNR Patianska cerina for the years 1946–1953 (data adopted from the conditions of the district town of Levice).

STAND DESCRIPTION

The stand is predominantly a TCO-stage one. The upper stage is dominated by *Q. cerris*, which in most cases is composed of adult trees and receding individuals. A relatively large number of these trees in the upper stage stand in the form of dried and/or broken trunks but also lie as fragments and uprooted trunks. The upper stage shows lacunae due to the light, the fallen decayed trunks lie in disorganized positions. They are markedly overgrown by wood-rotting fungi, less known of which is being e.g. *Hericium clathroides* (Pallas ex Fr.) Pers. The richest component s that of level trees with vertical canopy becoming markedly dominant.

The lower stage is richly developed at approximately 75 per cent of the NNR area. Parallel with the forest type change (Hančinský 1972) the composition of the lower stage is changing too. On the flat ridge and on the inexpressive converging hill ridges and/or the bulges of the vertically undulated slope the most frequently represented is the hawthorn bush, other areas are dominated by the field maple with local admixtures of the Tartar maple. Only one part of the NMR has a slight admixture of the common hazel. In the youngest part of the reservation the lower stage is missing, the main level of woody plants here is substantially lower in height and age. About one-third to a half *Q. cerris* trees of the upper stage have grown from seed. Wood composition is shown in Table 1.

Moisture conditions are favourable on the whole territory of the NNR. In addition to the abovementioned Walter climatogram this is probably caused by good vegetation coverage of the soil surface.

The tallest *Q. cerris* trees are found mainly in the lower parts of the reservation, namely between 28 and 32 metres of trees with perimetres about 2,40 m (Photo 1), aged up to 250 years, but mostly between 180 and 220 years. Approximately 20% of all trees belonging to vertical stratification 1 and 2 are in damaged health condition. Frequent is the "cancer" of the stem. On the other hand, natural rejuvenation of 2 to 5 year-old seedlings of *Q. cerris* is richly represented on the whole territory of the NNR.

Photo 1. One of the tallest *Quercus cerris* trees in the NNR Patianska cerina.

The dominant woody plant *Quercus cerris* asserts itself, as it can be seen in Table 1, among overgrowing and level trees, besides being richly represented in layer 5_2 composed of 2–5 year-old natural rejuvenation covering the whole area. The smallest representation or total lack of *Q. cerris* is in layers 3 and 4. Worth noting is another oak species, *Quercus dalechampii*. It is present mostly in the main layer, its trunk is not particularly shaped, and is admixed more or less in groups. In many cases its crown is composed of several (2 to 3) main branches, which could suggest certain age seniority with respect to the surrounding trees.

Naturally occurring oaks include further *Quercus virgiliana*. It is presented by several trees in the main level and among in-growing trees mainly in the highest parts of the NNR. In most cases, however, it reaches the main level. It can be well differentiated because of its bark (Photo 2).

Similarly represented is also *Quercus robur*, not confined only to the main ridge. *Quercus pedunculiflora* is presented by several examples only, in not quite a typical shape. *Quercus*

Table 1. Dendroentry

Sociological position	Woody plant	Representation
1	2	3
1	*Quercus robur* L.	–
(overgrowing)	*Q. cerris* L.	10
	Q. dalechampii Ten. (stalked fruits var.hungarica, f. hungarica, 1 exempl.)	–
2	*Betula pendula* Roth	–
(level trees)	*Q. cerris* L.	40
	Q. dalechampii Ten.	5
	Q. pedunculiflora C. Koch	–
	Q. robur L.	+
	Q. virgiliana Ten.	+
	Tilia cordata Mill.	–
3	*Acer pseudoplatanus* L.	–
(in-growing)	*A. campestre* L.	+
	A. pseudoplatanus L.	–
	Aesculus hippocastanum L.	+
	Carpinus betulus L.	–
	Cerasus avium (L.) Moench	+
	Fraxinus excelsior L.	–
	Parthenocissus quinquefolia (L.) Planch.	+
	Quercus cerris L.	5
	Q. dalechampii Ten.	+
	Q. pedunculiflora K. Koch	–
	Q. polycarpa Schur	–
	Q. virgiliana Ten.	+
	Robinia pseudoacacia L.	marginal part
	Ulmus minor Mill.	–
4	*Acer campestre* L.	30
(suppressed)	*A. platanoides* L.	–
	A. tataricum L.	10
	Cerasus avium (L.) Moench	+
	Cornus mas L.	+
	Corylus avellana L.	–
	Crataegus laevigata (Poir.) DC.	–
	C. monogyna Jacq.	+
	Fraxinus excelsior L.	–
	Padus serotina (Ehrh.) Borkh.	–
	Parthenocissus quinquefolia (L.) Planch.	+
	Quercus dalechampii Ten.	+
	Rhamnus catharticus L.	+
	Sambucus nigra L.	+
	Swida sanguinea (L.) Opiz	+
	Ulmus laevis Pall.	–
5_1	*A. campestre* L.	1–2
	A. pseudoplatanus L.	–
	A. tataricum L.	1
	Carpinus betulus L.	–
	Cornus mas L.	1
	Corylus avellana L.	–
	Crataegus laevigata (Poir.) DC.	1
	C. monogyna Jacq.	–2
	Euonymus europaeus L.	–

1	2	3
	E. verrucosus Scop.	–
	Fraxinus excelsior L.	–
	Ligustrum vulgare L.	+2
	Padus serotina (Ehrh.) Borkh.	–
	Parthenocissus quinquefolia (L.) Planch.	–2[1]
	Prunus spinosa L.	1
	Quercus cerris L.	+
	Sambucus nigra L.	1
5_2	*Acer campestre* L.	1–2
	Ligustrum vulgare L.	1
	Prunus spinosa L.	–1
	Quercus dalechampii Ten.	–
	Q. cerris L.	1–2
	Robinia pseudoacacia L.	–1
	Rosa canina L.	+
	Rubus caesius L.	1
	Sambucus nigra L.	1

Photo 2. The Adriatic oak (*Quercus virgiliana* Ten.) has also been registered in the NNR.

polycarpa, too, is present in several trees only, west of the local tree nursery.

The second most frequent tree was *Acer campestre*. It is the main agent of the lower layer on most of the NNR territory. It shades the soil surface markedly. This maple species is mostly present on slopes and adjoining relief formations, predominantly in good health condition. Its perimeter at d1.3 reaches up to 0,90 m.

Hawthorn species are well represented in the lower stage, the dominant being *Crataegus monogyna*, mostly on the main ridge and on slight slope undulations where it reaches 3 to 6 metres in height.

Carpinus betulus has also been recorded, although it is rare in these areas, on N slope exposition in the younger part of the tree stand, where it formed about 15% admixture and caused marked shading of the soil surface.

Corylus avellana showed a similarly rare occurrence in the surrounding stands. Only one cluster has been noted in the whole NNR, under *Q. cerris* canopy.

The genus *Ulmus* was represented only symbolically, by TCO species (*Ulmus minor, U. laevis*) but without a practical impact on the NNR.

Richly represented was *Acer tataricum*, although in the surrounding stands it is relatively insignificant.

Other autochthonous shrubs did not command special attention since their occurrence was similar to that of the surrounding stands (*Ligustrum vulgare, Sambucus nigra, Prunus spinosa* etc. – cf. Table 1).

Foreign elements are present in the form of *Robinia pseudoacacia* (especially marginal parts of the western side of the reservation), *Aesculus hippocastanum* close to former farm buildings and *Parthenocissus quinquefolia*

Table 2. Herbal synusia (13-16. VI. 2000)

Taxon	Representation
Alliaria petiolata (Marsch.-Bieb.) Cavara et Grande	1
Allium scorodoprasum L.	–
Anthriscus sylvestris (L.) Hoffm.	+1
Arctium lappa L.	+1
Astragalus glycyphyllos L.	–
Brachypodium pinnatum (L.) P. Beauv.	–1
Bromus benekenii (Lange) Trimen	1
Clinopodium vulgare L.	–
Campanula rapunculoides L.	+
Dactylis glomerata L.	1
Deschampsia caespitosa (L.) P. Beauv.	+
Fallopia convolvulus (L.) Á. Löve	1–2
Ficaria verna Huds.	+
Fragaria vesca L.	–
Galium aparine L.	2
G. schultesii Vest	+1
Geranium robertianum L.	+1–2
Geum urbanum L.	1
Glechoma hederacea L.	1
Heracleum sphondylium L.	–
Hieracium pilosum Schleich. ex Froel.	–
Impatiens parviflora DC.	4
Lapsana communis L.	+
Lathyrus niger (L.) Bernh.	+
Melittis melissophyllum L.	–
Moehringia trinervia (L.) Clairv.	–
Mycelis muralis (L.) Dumort.	+
Poa angustifolia L.	–1
Poa nemoralis L.	1–2
Polygonatum odoratum (Mill.) Druce	1
Prunella vulgaris L.	–
Rubus fruticosus L. agg.	+
Silene nutans L.	–
Stachys sylvatica L.	+
Stellaria holostea L.	1-2[+2]
S. media (L.) Vill.	–
Urtica dioica L.	1 [2]
Vinca minor L.	1[2]
Vincetoxicum hirundinaria Medik.	–
Viola riviniana Rchb.	–
V. reichenbachiana Jordan ex Boreau	1

markedly occurring in the vicinity of the manor house.

In the herbal synusia (Table 2) low presence of grassy species is very conspicuous. Rather aggressive in the vernal aspect is *Impatiens parviflora* which, apart from the exceptions in younger stands, has singular coverage (Originating in southern Siberia, it has domesticated in our moister forests and shrubs, in gardens as a weed, in hedges and ditches – Dostál 1954). Further frequent species are *Urtica dioica, Stellaria holostea, Fallopia convolvulus* a *Galium aparine*. Herbal synusia could, on the whole, be characterized in its vernal aspect as unilateral, since the coverage is almost entirely provided by one herb.

Typologically the cenose belongs to the first vegetation grade. Dominant are hemisciophytes and hemiheliophytes, typically heliophytic or sciophytic species are missing. As far as the quantity of trees and bushes is concerned, it is dominated by heminitrophiles which, according to Hančinský (1972) classifies the cenose as belonging to the ecological line B/C (transitory line between nutrient and nitrophilous plants) and corresponds with the forest type group *Carpineto-Quercetum acerosum* (hornbeam-oak grove with maple) and particular forest type – Alliarious hornbeam-oak grove with maple on loess (1401). On bouldering slopes with small presence of *Acer campestre* it forms line B (nutrient) and the group of forest types *Carpineto-Quercetum* with forest type Brachypodious hornbeam-oak grove with maple on loess (1307).

Soil represents illimerized soil on loess (Photo 3) with underlying compressed soil. Stratigraphically it looks as follows:

A_0
A_1
A_3
Bt
C

A_0 A_{01} – 0–15 mm non-decomposed dropping,
A_{02} – 15–20 mm semi-decomposed dropping,
A_{03} – incoherent layer of humus,
A_1 – 20 to 60 mm humose horizon formed by brown, freshly moist, dusty to gritty, mellow, skeleton-free, sandy-loamy to loamy soil,
A_3 – 60 to 380 mm lean horizon, with mellow soil, freshly moist, gritty, sandy-loamy to loamy, skeleton-free, ochre-brown in colour,

Photo 3. Soil sound in the NNR Patianska cerina documenting illimerized soils.

Bt – 390 to 570 mm thick horizon, compressed, light-brown, slightly moist, loamy to clayey-loamy skeleton-free,
C – deeper than 570 mm, loess cover with sand admixture,
Intensive root system to 380 mm depth.

DISCUSSION

Information materials published so far on the NNR Patianska cerina have not mentioned some important facts concerning forest cenoses. This concerns firstly the herbal synusia. In the vernal aspect *Impatiens parviflora has* literally occupying onset, which has reached coverage value 4^{+4} (Photo 4). We do not think this species was overlooked in the past, it is more probable that it did not exist here, at least not in such an overwhelming quantity. Its presence in the recorded groups of forest types was not mentioned even by renowned authors writing about forest cenoses of Slovakia (Zlatník 1957, 1959; Hančinský 1972;

Randuška et al. 1986) and no documentation concerning the expansivity of *Impatiens parviflora* was brought at the underlying Public Notice No.185.288/1949-VII/2 either. The much later appearing publication Basic Facts on the territory suggested legal protection in accordance with Act 1/1955 of the Slovak National Council (i.e. Parliament of Slovakia within non-federal Czechoslovakia) on state guaranteed nature conservation (Randík 1970) in its Description of the Suggested Territory writes: "The herbal cenose here is characterized by: *Poa nemoralis, Brachypodium sylvaticum, Campanula rapunculoides, Dactylis glomerata* ssp. *polygona, Galium aparine, Genista tinctoria, G. germanica* ect.". The same was stated by Krištofíková (1982), and SÚPSOP (1975). There is no mention of *Impatiens parviflora* again.

Another element with expansive behaviour, especially around the former manor house, is *Parthenocissus quinquefolia* (L.) Planch. (five-leaved false vine) which has not been mentioned in any expert source either. At present it is gradually taking up more and more space horizontally and subsequently also vertically up to the tree crowns in the main level (too Photo 4).

Photo 4. Extraordinary coverage of *Impatiens parviflora* in the NNR Patianska cerina in the vernal aspect and aggressive foreign element *Parthenocissus quinquefolia*.

RECOMMENDATION

Patianska cerina is a singular and irreplaceable area the conservation of which should be beyond any doubt. This genuine oak grove dominated by *Q. cerris* should further maintain its status resulting from its inclusion into the national nature reservation as stipulated by Act No. 287/1994 Cod. The authors of the present paper believe it is necessary to use the NNR Patianska cerina for the observation of processes which can only occur in the nature. This could be subdivided into particular steps: (1) Following up the fact and determining the causes of the gradual decease of adult *Q. cerris* trees; (2) Ascertaining the age of the above decease and the sociological group of the trees in particular; (3) Surveying the natural rejuvenation of this oak species, the time and place of its onset and/or termination; (4) Cyclical follow-up, in e.g. 10-year periods of the changes in woody plant representation; (5) In addition to the abovementioned, evaluating which intraspecific *Q. cerris* taxons (sensu Požgaj, Horváthová 1986) show the highest and/or lowest variability; (6) In a similar sense, evaluating the appurtenance of the tallest trees to intraspecific taxons; (7) Surveying the assertion of foreign elements.

CONCLUSION

The National Nature Reservation Patianska cerina is the only reservation in Slovakia for the oak species *Quercus cerris* L. Its first mention dates from 1927. For foresters (and growers and dendrologists) this NNR has rached the interesting stage of development in which there occurs the onset of vertical canopy and the decease of weaker trees in *Q. cerris* population. It can be used for surveying the generation change and the changes in woody plant composition. It has a well-developed lower stage dominated by *Acer campestre* L., *Crataegus monogyna* Jacq. and the frequently occurring *Acer tataricum* L. The herbal synusia in the vernal aspect is absolutely dominated by the foreign element *Impatiens parviflora* DC. Other foreign elements at the western margin of the NNR include *Robinia pseudoacacia* L. The area around the former manor house is also dominated by the North American dendroflora representative *Parthenocissus quinquefolia* (L.) Planch. Soils are illimerized.

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