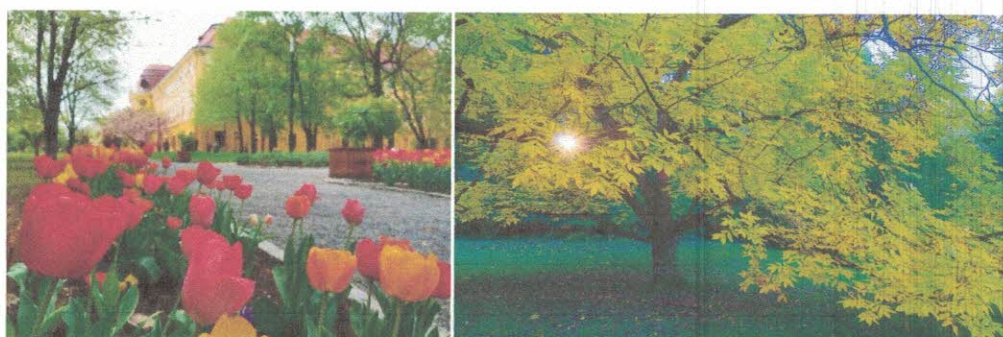
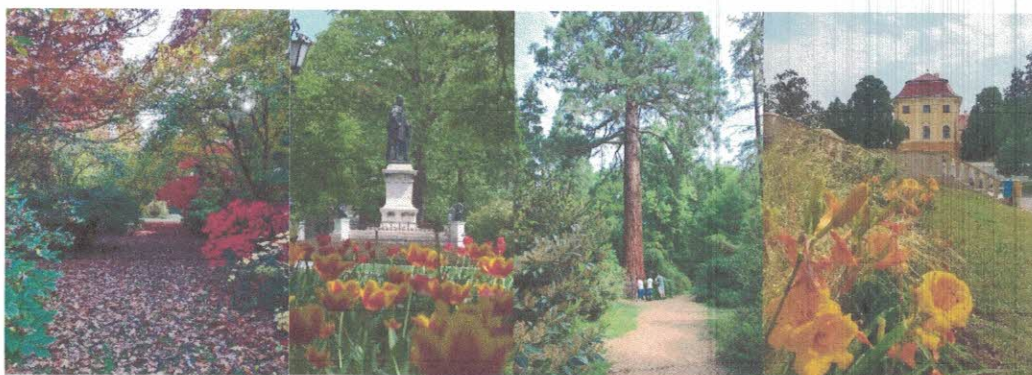


# ROHU-35 GREENING FOOTPRINTS

## RESULTS AND INDICATORS



Szarvas, Oradea  
2022

THE PURPOSE OF THIS STUDY IS THE SUBSTANTIATED SUPPORT OF THE RESULTS OF THE ROHU-35 GREENING FOOTPRINTS PROJECT AND THE PRESENTATION OF A SYSTEM FOR MONITORING INDICATORS IN TIME.

## MATE SZARVAS ARBORETUM, SZARVAS, HUNGARY

The ROHU-35 "Greening footprints" project was implemented at the MATE Szarvas Arboretum. The project elements created are expected to have and will have a significant impact on the surrounding areas.

Among the developments of the project, buildings and structures supporting the tourism in the area were made, as well as habitat improvements that contribute to the role of protected natural areas, NATURA 2000 areas and near-natural areas in the area.

In the immediate vicinity of the implementation sites, interoperability has been established for the organisms living or occurring there, thus the biodiversity of the areas is expected to increase.

We monitor the environmental factors and their effects by observing different groups of organisms in the undertaken indicator area and in the wider area.

### Presentation of the affected narrower environment

The area of the Szarvas Arboretum (Szarvas 795 hrsz.) was designated a protected natural area of national importance by the Minister of Agriculture by Decree No. 121004/1943 in accordance with 1935.IV.212.§ section b.

Following the declaration of it as a protected area in 1943, the National Nature Conservancy Council regulated, through the supplementary decision no. 453/1951, the management of the Szarvas Arboretum. In the Békés Plain, which bears all the characteristics of the Great Plain, the most special tree species from foreign parts of the world, the rocky and swampy landscapes of the Alps and the Tropics, form a real oasis. The value that this arboretum, with its acclimatized tree species, represented in scientific, forestry and horticultural terms, is invaluable, and we must therefore do everything we can to maintain and develop it.

The **total area of the Arboretum is 82 ha**, which includes the Békésszentandrás 074/1 and 074/2 hrsz areas in addition to the above-mentioned Szarvas 795 hrsz area.

The total area lists five collections. Of these, the oldest planted stand is the Pepi Garden, a defining example of the late landscape garden. The Kitchen Garden was once intensively cultivated with vegetables and orchards, today it is organically and imperceptibly connected to the landscape garden, although its special dendrological values are slightly younger than those found in the Pepi Garden. The Mitrovsky Garden, the former nursery, has now also been nicely integrated into the landscape garden as a result of about 20 years of horticultural treatment.

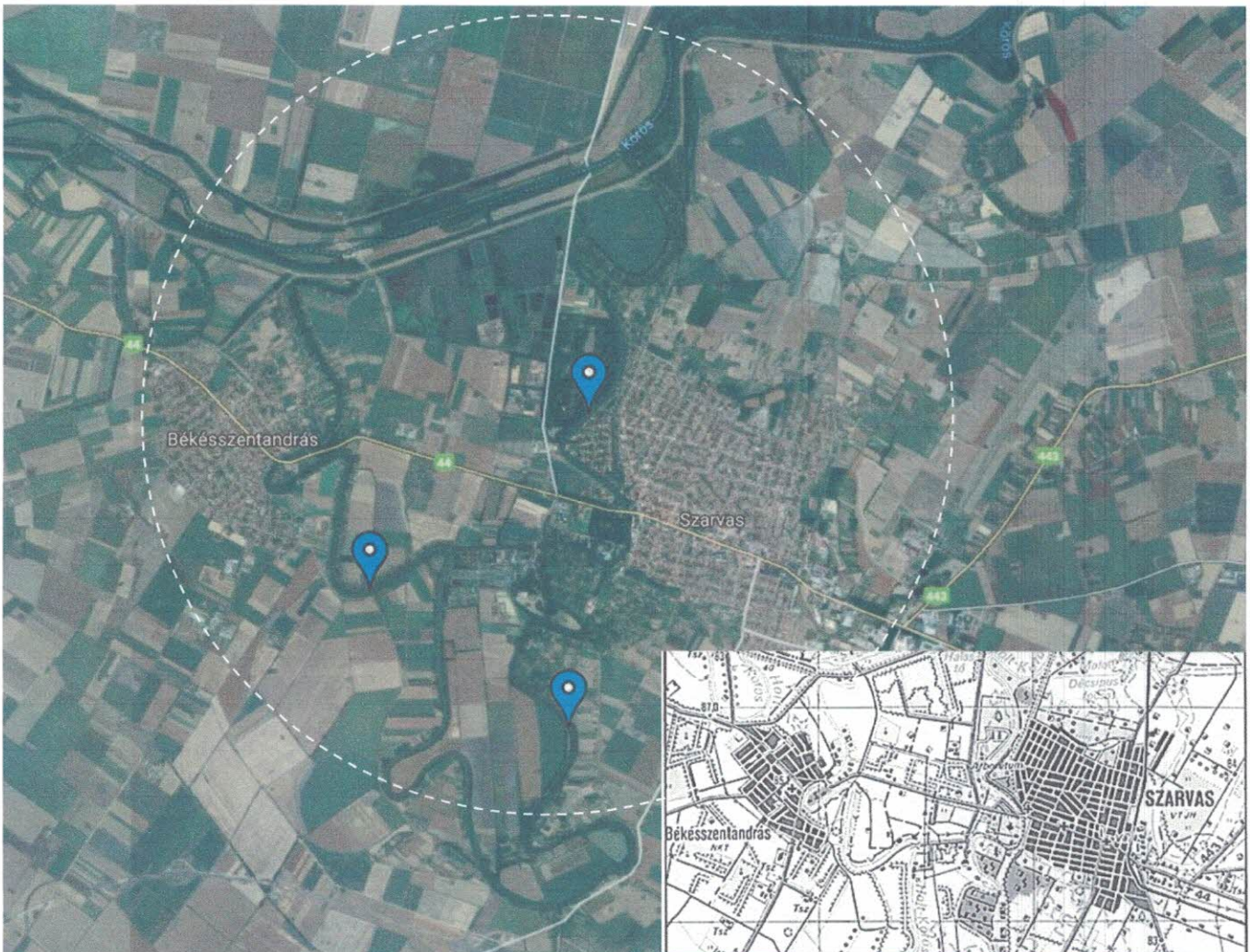
Of the northern areas that were still used as arable land in the '60s, the Park Forest can be visited from 2014 onwards. Its young dendrological collection is in an interesting spatial harmony. In the territory of the tree nursery, there is the evergreen variety collection, as well as the 4-hectare area implemented through the present project and which can be presented to the visitors.

As a result of the well-planned management and maintenance work at the project sites, the protection and condition of the habitats will be improved significantly even at the end of the project.

### The presentation of the impacted wider environment

The developments of the project in the Arboretum have a significant direct and indirect impact on the two territorially affected settlements (Szarvas, Békésszentandrás), with a total area of 23,902 ha. The new investment is decisive for both the people living in the settlements and the guests visiting the two settlements, on the one hand due to the environmental factors, the improvement of the ecosystem, and on the other hand due to the increase of the touristic goal.





The increase of the number of visitors to the Arboretum has already occurred in the first year since the beginning of the project period. The year 2020 has pushed this back a bit due to the viral situation, but it is expected that by the end of the year the number will be reached this year as well, compared to the beginning period of the project. The visitors to the Arboretum will be able to visit the new section once the works are completed and the workspace is handed over.

The developments of the project have an impact on the entire micro-region, Békés county and cross-border areas, as the new investments are decisive both for the people living in the surrounding settlements and for the guests visiting the area, due to the attendance expansion.

With regard to the Arboretum, the competent nature conservation authority is the Körös-Maros National Park Directorate. The Nature Conservancy Register number of the area is 157-455/1951. O.T.T.

Among the protected natural areas of national importance belonging to the National Park, the Körös floodplain territorial unit is in direct contact with the wildlife of the Szarvas Arboretum, which should be treated as a priority habitat unit due to its territorial proximity and the Körös backwater. In addition, the Cserebökény area of the National Park, **in the settlements of Szarvas and Békésszentandrás** – according to Government Decree No. 275/2004. (X. 8.) on areas of European importance for nature conservation, community plant and animal species and habitats as defined in the EU directives – were designated NATURA 2000 areas, the protected natural areas of local significance and local green areas representing the habitat relationship on which the tender investment has a measurable impact that can be monitored.



## The living communities and environmental elements of the examined indicator area (Szarvas, Békésszentandrás), Second year of monitorization

### Plant associations

The original (pre-river regulation) plant association of the areas near Körös may have been the floodplain groves (*Fraxino pannonicae - Quercetum roboris*). This is inferred from the presence of old pedunculate oaks and Pannonian ash still living in the area today. In the higher areas, patches of loess steppe associations presumably also occurred, such as the alkaline oak (*Galatello-Quercetum roboris*) forest.

In the two settlements affected by the change in the ecosystem, one or two elements of the original landscape have been left in the artificially developed environment of the parks, gardens and other green areas, but these are not decisive for the area as a whole. The vegetation cover of native and exotic species found here cannot be classified as a natural association category. In addition to the green areas, the two settlements in the indicator area are characterized by residential houses in the inner area and large, intensively cultivated arable lands in the outer area.

***During the observation period (1st of June 2021. –31st of may 2022) based on the experience of regular territorial visits, it can be stated that the proportion of natural, close to nature and planted, intensively treated surfaces (parks, small gardens) has not changed compared to the baseline condition.***

### Mushrooms

A survey of the cap fungi was conducted in the two settlements over five years, the highest diversity being found in the Arboretum, with a total of 211 different species. With the habitat development results of the present project, it is expected that some of these species may be transferred to the ecosystems of Szarvas and Békésszentandrás directly connected to the area.

*Following the habitat development of the project, some species appeared in Szarvas and Békésszentandrás ecosystems directly connected to the area in the spring and rainy period, but unfortunately we could not show any results in the extremely dry period. Probably, the appearance of a bigger settlement is expected only with the spread of spores and the formation of mycorrhizal filaments.*

***In the fall and early winter of the second year, the rainfall intensity was average, but the spring brought extreme dryness, which did not favor the appearance of the mushrooms. They were present in a minimal period with a minimal number of species and in quantity.***

### Herbaceous plants

So far, 239 herbaceous plant species have been found in the Arboretum, of which 187 species can be considered native, such as: the male fern, the broad-leaved enchanter's nightshade, the yellow archangel, the lily of the valley of May, the common snowdrop, etc. There are 52 planted species, such as: the eagle fern, the fragrant hellebore, the liverwort, the myrtle, the small globe thistle, the holewort, the butcher's broom, the Siberian iris and the exotic ones including the swamp sunflower, the yellow daylily, the orange daylily, the pampas grass, the daffodils etc.

Most herbaceous plants live on lawn surfaces. Among the directly related ecosystems, herbaceous plants are expected to mix with habitat improvements, thereby increasing biodiversity, especially on favorable (deeper, semi-shady, favorable climate) surfaces.

In lawn ecosystems directly related to the project site, we expected the mixing of herbaceous plants in deeper, semi-shady, favorable climate areas, but this was not detectable in the first year.

### Woody plants

With regard to woody plants, in addition to the few species in the parks and roads of the settlements, the number of taxa of woody plants living in the Szarvas Arboretum is almost 1,600. Gene bank taxa (species, variety): 292. 259 of the gene bank plants are deciduous and 636 are evergreen.

The habitat development investments of the project directly support the plantation of these gene bank plants, from which propagating material can be sent to the indicator areas.



The project's habitat development investments have improved the habitat conditions for gene bank plants living in the Arboretum. During the study period (June 1, 2020 - May 31, 2021), we collected the propagation formulas that were planted and sprouted. These seedlings are planted in the indicator areas after 3-4 years of rearing and individual treatment.

**In the second year (June 1, 2021 - May 31, 2022), the task was the maintenance and individual treatment of the small plants, which was successful, as the survival rate is 90%. Only the strengthened, hardened seedlings will be placed in the indicator areas after 3-4 years of care.**

## Fauna

### Molluscs (Mollusca)

The malacological observations in the area - mainly in the vicinity of the Körös, in both settlements (Szarvas, Békésszentandrás) - show a nearly similar species stock as in the Arboretum. Of the 46 species, 31 are terrestrial and 15 aquatic, and 13 species were found to have been introduced.

**During the observation period for the Mollusca family there was no significant increase due to the long dry weather. Regarding this topic, the survey conducted in the second year of the investigated period (June 1, 2021 - May 31, 2022), we found only a fraction of the species included in the original survey, primarily due to the lack of rainfall.**

### The beetle fauna

In the case of the species that can appear in the indicator areas, 421 beetle species were identified based on the observations in the Szarvas Arboretum. These can be divided into four major groups: deciduous forest species (which have the largest number due to the nature of the area), pine species, species of woodless land groups, and occasional guests.

Protected and endangered beetle species found in the Szarvas Arboretum:

<i>Dorcus parvulus</i>	V
<i>Lucanus cervus</i>	V „currently at risk”
<i>Oryctes nasicornis</i>	V
<i>Cetonischema aeruginosa</i>	V „currently at risk”
<i>Megopis scabricornis</i>	V
<i>Theophilea subcylindricollis</i>	V

During the observation period (between 1st of June 2020 and 31st of May 2021) some species of the beetle fauna such as *Cetonischema aeruginosa*, *Megopis scabricornis* and *Theophilea subcylindricollis* couldn't be found.

**During the investigation of the development of the beetle fauna, the magnificent flower beetle (*Cetonischema aeruginosa*) was not found among the selected species in the period under investigation (June 1, 2021 - May 31, 2022).**

### The bird fauna

Birdwatching has been ongoing at the Arboretum since 1960.

The distribution of the observed bird species by fauna type between 1960-1991 (Réthy 1997):

Fauna types	Number of bird species (pcs)	Frequency (%)
Palaearctic	39	43,3
Euro-Turkestan	13	14,5
European	10	11,1
Holarctic	8	8,9
Old World	7	7,8
Cosmopolitan	3	3,4



Fauna types	Number of bird species (pcs)	Frequency (%)
Siberian	2	2,2
Turkish Mediterranean	2	2,2
Mediterranean	2	2,2
Indo-African	1	1,1
Ethiopian	1	1,1
Siberian-Canadian	1	1,1
Arctic	1	1,1
<b>Total</b>	<b>90</b>	<b>100,0</b>

**We cannot realistically compare the frequency distribution shown in the statement chosen as the basic data with the data surveyed in the examined period between: June 1, 2020 - May 31, 2022, as we are currently examining them. An opinionable data set can be interpreted at the earliest at the end of the maintenance period. Until then (until evaluation is possible), the data is recorded.**

#### Other animal species

Among the mammals, moles, hedgehogs, hares, badgers, deer and some families of foxes live in the Arboretum and adjacent areas. Four species of bats live in the Arboretum: the large, the small, the lake and the water bat, but other species can be found additionally in the examined indicator settlements. Their movement depends on the diversity of habitats.

During the night bat tours, only the presence of the four species was still observed in the Arboretum area, but their movement to the areas adjacent to the project area was observed.

**The movement of four species of bats that previously occurred in the Arboretum area was regularly observed in areas adjacent to the project area.**

#### Monitoring of environmental impacts in the project area

Direct and indirect effects will be examined by observations in the indicator area. Of our two selected segments, the members of the natural ecosystem are birds. We plan to make air pollution observations to study the artificial, anthropogenic influences.

With regard to the study sites, we also find it worthwhile to study large-scale impacts, which mainly affect the areas due to the urban environment. Of the many effects, we intended to review and then measure the air purity data sets.

#### Bird monitoring

In the case of birds, the bird species found so far in the Arboretum are taken as the basic data for monitoring:

The name of the bird	Nesting	Probably nesting	Migratory	Raptors	Flying over
<i>Phalacrocorax carbo</i>					+
<i>Ixobrychus minutus</i>					+
<i>Nycticorax nycticorax</i>	+				
<i>Ardeola ralloides</i>	+				
<i>Egretta garzetta</i>	+				
<i>Egretta alba</i>					+
<i>Ardea cinerea</i>					+
<i>Ciconia nigra</i>					+
<i>Ciconia ciconia</i>					+
<i>T Anas platyrhynchos</i>	+				
<i>Haliaëtus albicilla</i>					+
<i>Circus aeruginosus</i>					+



The name of the bird	Nesting	Probably nesting	Migratory	Raptors	Flying over
<i>Circus cyaneus</i>				+	
<i>Accipiter gentilis</i>				+	
<i>Accipiter nisus</i>		+			
<i>Buteo buteo</i>	+			+	
<i>Buteo lagopus</i>				+	
<i>Falco trinnunculus</i>				+	
<i>Falco subbuteo</i>					
<i>Phasianus colchicus</i>	+				+
<i>Grus grus</i>					+
<i>Vanellus vanellus</i>					+
<i>Numenius phaeopus</i>					+
<i>Tringa totanus</i>					+
<i>Tringa ochropus</i>					+
<i>Larus ridibundus</i>					+
<i>Larus argentatus</i>					+
<i>Sterna hirundo</i>					
<i>Columba palumbus</i>	+				
<i>Streptopelia decaocto</i>	+				
<i>Streptopelia turtur</i>	+				+
<i>Columba livia f. domestica</i>					
<i>Cuculus canorus</i>	+				
<i>Athene noctua</i>	+				
<i>Strix aluco</i>	+				
<i>Asio otus</i>		+			
<i>Upupa epops</i>		+			
<i>Picus viridis</i>	+				
<i>Dryocopus martius</i>	+				
<i>Dendrocopos major</i>	+				
<i>Dendrocopos syriacus</i>	+				
<i>Dendrocopos medius</i>				+	
<i>Dendrocopos minor</i>	+				
<i>Galerida cristata</i>		+			
<i>Alauda arvensis</i>		+			
<i>Hirundo rustica</i>	+				
<i>Delichon urbica</i>	+				
<i>Anthus trivialis</i>		+			
<i>Anthus pratensis</i>			+		
<i>Motacilla alba</i>	+				
<i>Troglodytes troglodytes</i>				+	
<i>Prunella collaris</i>			+		
<i>Erithacus rubecula</i>	+				
<i>Luscinia megarhynchos</i>	+				
<i>Phoenicurus ochruros</i>	+				
<i>Phoenicurus phoenicurus</i>		+			
<i>Turdus torquatus</i>			+		
<i>Turdus ruficollis</i>	+				
<i>Turdus pilaris</i>				+	
<i>Turdus philomelos</i>	+				
<i>Turdus viscivorus</i>			+		
<i>Acrocephalus palustris</i>		+			
<i>Acrocephalus arundinaceus</i>	+				



The name of the bird	Nesting	Probably nesting	Migratory	Raptors	Flying over
<i>Sylvia communis</i>	+				
<i>Sylvia atricapilla</i>	+				
<i>Sylvia curruca</i>	+				
<i>Phylloscopus sibilatrix</i>		+			
<i>Phylloscopus collybita</i>	+	+			
<i>Phylloscopus trochilus</i>				+	
<i>Regulus regulus</i>			+		
<i>Regulus ignicapillus</i>					
<i>Muscicapa striata</i>	+				
<i>Ficedula parva</i>			+		
<i>Ficedula albicollis</i>			+		
<i>Ficedula hypoleuca</i>			+		
<i>Aegithalos caudatus</i>	+			+	
<i>Parus ater</i>					
<i>Parus caeruleus</i>	+				
<i>Parus major</i>	+				
<i>Sitta europaea</i>	+				
<i>Certhia brachydactyla</i>	+				
<i>Oriolus oriolus</i>	+				
<i>Lanius collurio</i>	+				
<i>Garullus glandarius</i>	+				
<i>Pica pica</i>	+				
<i>Corvus monedula</i>	+				
<i>Corvus frugilegus</i>		+			
<i>Corvus corone cornix</i>		+			
<i>Strunus vulgaris</i>	+				
<i>Passer domesticus</i>	+				
<i>Passer montanus</i>	+				
<i>Fringilla coelebs</i>	+				
<i>Fringilla montifringilla</i>				+	
<i>Serinus serinus</i>	+				
<i>Carduelis chloris</i>	+				
<i>Carduelis carduelis</i>	+				
<i>Carduelis spinus</i>	+				
<i>Carduelis cannabina</i>				+	
<i>Pyrrhula pyrrhula</i>				+	
<i>Coccothraustes coccothraustes</i>		+		+	
<i>Emberiza citrinella</i>					

**Bird observations during the study period (June 1, 2021 - May 31, 2022) yielded the following result. (Changes highlighted.)**

The name of the bird	Nesting	Probably nesting	Migratory	Raptors	Flying over
<b>Ardea cinerea</b>				+	
<i>Phalacrocorax carbo</i>					+
<b>Ixobrychus minutus</b>		+			
<i>Nycticorax nycticorax</i>	+				
<i>Ardeola ralloides</i>	+				
<i>Egretta garze</i>	+				+
<i>Egretta alba</i>					
<b>Ardea cinerea</b>	+				+
<i>Ciconia nigra</i>				+	
<b>Ciconia ciconia</b>					
<i>T Anas platyrhynchos</i>	+				+
<i>Haliaeetus albicilla</i>					+
<i>Circus aeruginosus</i>					+
<b>Circus cyaneus</b>				+	
<i>Accipiter gentilis</i>					
<b>Accipiter nisus</b>	+				
<i>Buteo buteo</i>	+				+
<b>Buteo lagopus</b>				+	
<i>Falco trinnunculus</i>					+
<b>Falco subbuteo</b>					
<i>Phasianus colchicus</i>	+				+
<i>Grus grus</i>					+
<i>Vanellus vanellus</i>					+
<i>Numenius phaeopus</i>					+
<i>Tringa totanus</i>					+
<i>Tringa ochropus</i>					+
<i>Larus ridibundus</i>					+
<i>Larus argentatus</i>					+
<i>Sterna hirundo</i>					
<i>Columba palumbus</i>	+				
<i>Streptopelia decaocto</i>	+				
<i>Streptopelia turtur</i>	+				+
<i>Columba livia f. domestica</i>					
<i>Cuculus canorus</i>	+				
<i>Athene noctua</i>	+				
<i>Strix aluco</i>	+				
<b>Asio otus</b>	+				
<b>Upupa epops</b>				+	
<i>Picus viridis</i>	+				
<i>Dryocopus martius</i>	+				
<i>Dendrocopos major</i>	+				
<i>Dendrocopos syriacus</i>	+				
<i>Dendrocopos medius</i>				+	
<i>Dendrocopos minor</i>	+				
<b>Galerida cristata</b>				+	
<i>Alauda arvensis</i>		+			
<i>Hirundo rustica</i>	+				



The name of the bird	Nesting	Probably nesting	Migratory	Raptors	Flying over
<b>Ardea cinerea</b>				+	
<i>Delichon urbica</i>	+				
<i>Anthus trivialis</i>		+			
<i>Anthus pratensis</i>			+		
<i>Motacilla alba</i>	+				
<b>Troglodytes troglodytes</b>		+			
<i>Prunella collaris</i>			+		
<i>Erithacus rubecula</i>	+				
<i>Luscinia megarhynchos</i>	+				
<i>Phoenicurus ochruros</i>	+				
<i>Phoenicurus phoenicurus</i>		+			
<i>Turdus torquatus</i>			+		
<i>Turdus ruficollis</i>	+				
<b>Turdus pilaris</b>		+			
<i>Turdus philomelos</i>	+				
<i>Turdus viscivorus</i>			+		
<i>Acrocephalus palustris</i>		+			
<i>Acrocephalus arundinaceus</i>	+				
<i>Sylvia communis</i>	+				
<i>Sylvia atricapilla</i>	+				
<i>Sylvia curruca</i>	+				
<i>Phylloscopus sibilatrix</i>		+			
<i>Phylloscopus collybita</i>	+				
<i>Phylloscopus trochilus</i>		+			
<i>Regulus regulus</i>				+	
<i>Regulus ignicapillus</i>			+		
<i>Muscicapa striata</i>	+				
<i>Ficedula parva</i>			+		
<i>Ficedula albicollis</i>			+		
<i>Ficedula hypoleuca</i>			+		
<i>Aegithalos caudatus</i>	+			+	
<i>Parus ater</i>					
<i>Parus caeruleus</i>	+				
<i>Parus major</i>	+				
<i>Sitta europaea</i>	+				
<i>Certia brachydactyla</i>	+				
<i>Oriolus oriolus</i>	+				
<i>Lanius collurio</i>	+				
<i>Garullus glandarius</i>	+				
<b>Pica pica</b>					+
<i>Corvus monedula</i>	+				
<i>Corvus frugilegus</i>		+			
<i>Corvus corone comix</i>		+			
<i>Strunus vulgaris</i>	+				
<i>Passer domesticus</i>	+				
<i>Passer montanus</i>	+				
<i>Fringilla coelebs</i>	+				

The name of the bird	Nesting	Probably nesting	Migratory	Raptors	Flying over
<b>Ardea cinerea</b>				+	
<i>Fringilla montifringilla</i>				+	
<i>Serinus serinus</i>	+				
<i>Carduelis chloris</i>	+				
<i>Carduelis carduelis</i>	+				
<b>Carduelis spinus</b>		+			
<i>Carduelis cannabina</i>				+	
<i>Pyrrhula pyrrhula</i>				+	
<b>Coccothraustes coccothraustes</b>	+				
<i>Emberiza citrinella</i>				+	

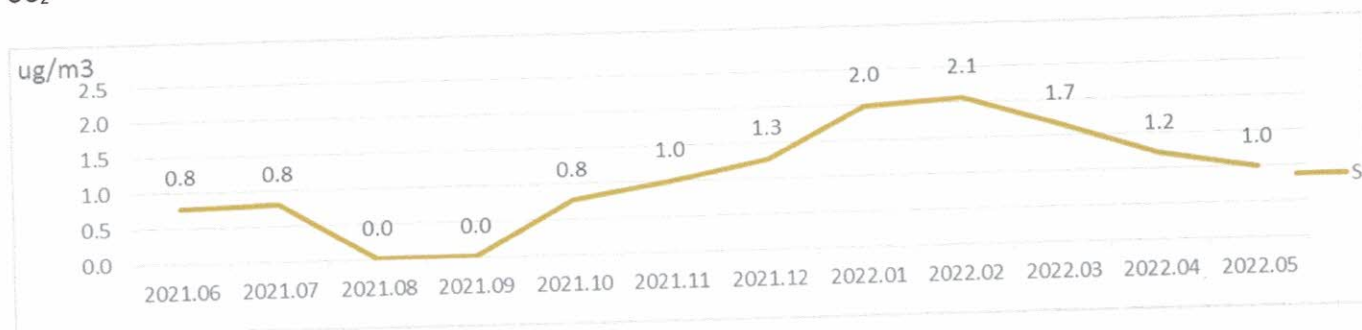
Certainly, the observed bird species nest or turn around in the area only due to the optimal habitat conditions of the arboretum environment, only a part of them nest or feed in the outer, urban parts, but their appearance and passage in the indicator areas can be considered 100%.

#### Air pollution monitoring

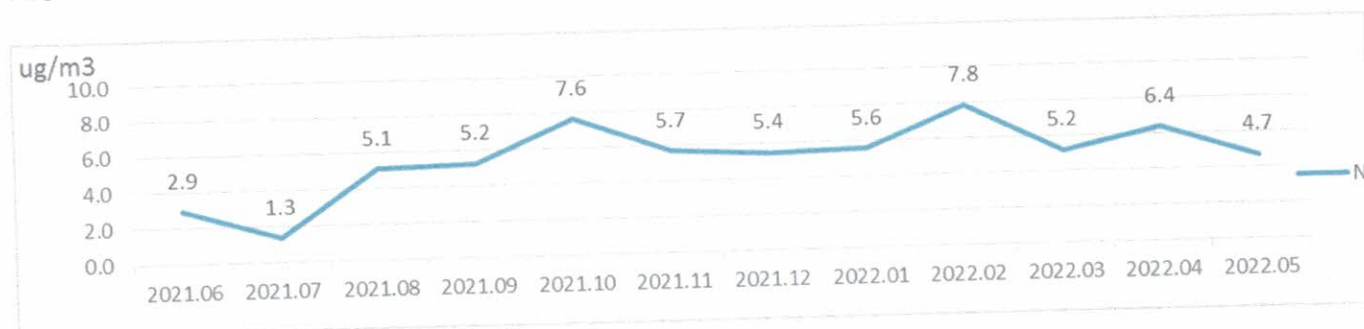
Regular adsorption measurements provide an opportunity for the application partners to meet regularly and have regular professional discussions with each other.

**Air pollution was measured on a monthly basis using some indicators (SO<sub>2</sub>, NO<sub>2</sub> and particulate matter (PM<sub>10</sub>) data). During the period under review (1 June 2021 to 31 May 2022), this was as follows:**

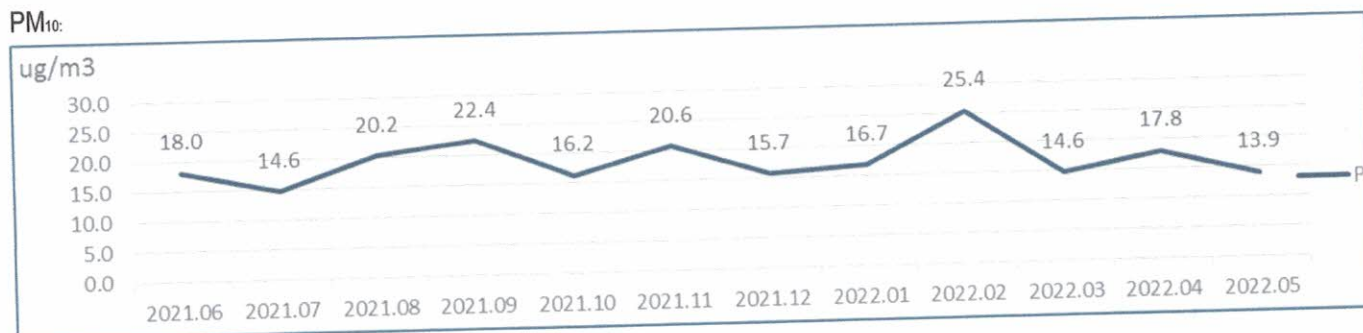
SO<sub>2</sub>



NO<sub>2</sub>:







**From the data it can be concluded that no exceptionally high levels of pollution were measured in the study area and period, the data (as expected) indicate a relatively low pollution region.**

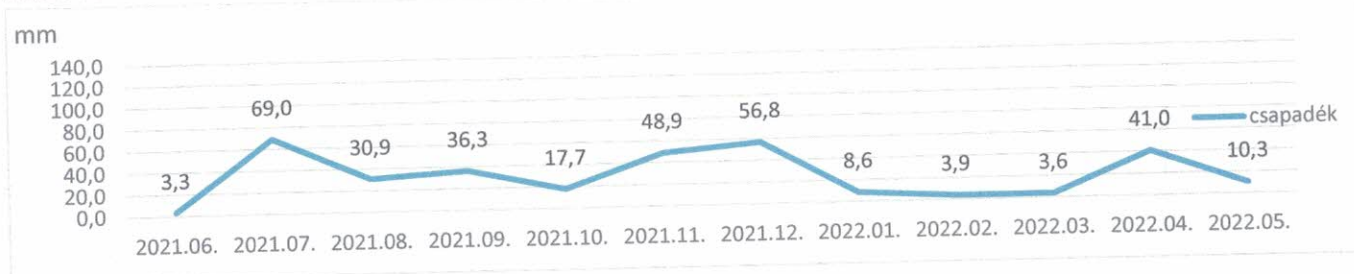
### Summary

As a result of well-planned management and maintenance work at the project sites, the protection and condition of the habitats may show a significant improvement, which is likely to have an impact on the indicator areas. In the area of Szarvas and Békésszentadrás settlements, this can be checked by regular and specific monitoring activities.

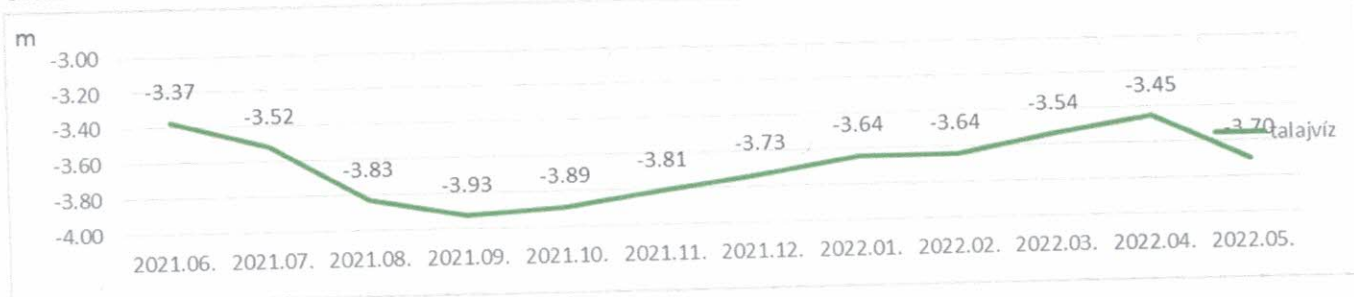
The result is the success of the interventions, which contribute to and influence the natural environment, the ecosystems and the conservation of the natural diversity in the area.

*During the monitorization, we considered it important to observe the rainfall and temperature data sets from the daily recorded meteorological data in the light of the project, as these two data sets accurately determine the climatic background of the given periods, which affects the communities listed in the observations. In addition to meteorological data, the current groundwater level was also measured. Data were recorded and evaluated on a monthly basis. The results show that winter precipitation is clearly reflected in groundwater levels, while summer precipitation peaks do not affect groundwater levels due to high temperatures, increased water absorption and evaporation.*

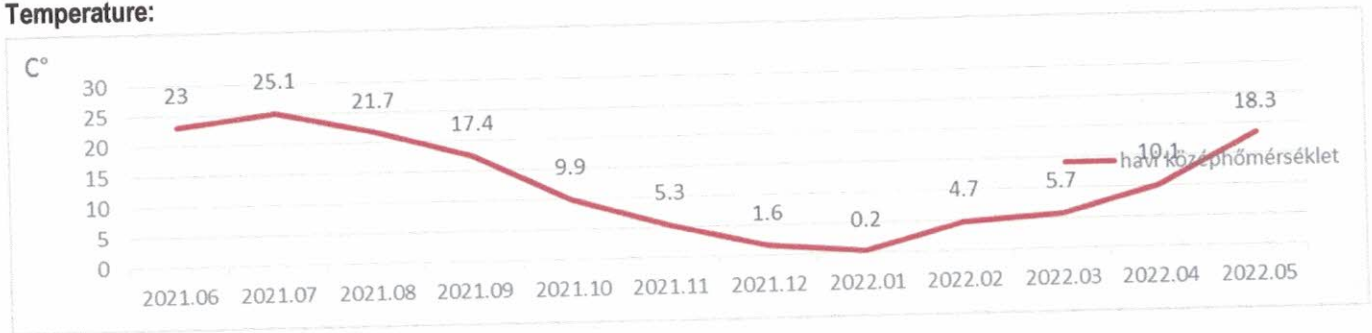
### Fall-level:



### Groundwater-level:



## Temperature:



## BAROQUE PALACE DENDROLOGICAL PARK, ORADEA, ROMANIA

The aim of the investment is to develop the Baroque Palace Dendrological Park, defined by the Bihor County Council Decree No. 19/1995 "Measures for the Management and Protection of Nature Reserves" a protected natural area, to improve the conservation status of species, habitats and ecosystems in the given urban environment according to biodiversity and the provision of ecosystem services.

The dendrological park is located in a protected monumental environment, the buildings located in its territory and the adjacent buildings are monuments of national significance, which individually and together represent an extremely significant artistic and historical value. The garden has the status of a historical garden, during its development the protection of the natural heritage has been combined with the preservation of the built heritage.

The owner and custodian of the dendrological park is the Roman Catholic Diocese of Oradea.

### Presentation of the investment

Compared to the large Baroque and landscape gardens, the surface of the episcopal garden is small, however 633 trees, 237 shrubs, 320 rose stalks and 92 conifers were counted at the dendrological evaluations of the garden in 2019. In the dendrological park neglected for years, the plants became wild, therefore, during the rehabilitation works, the structure of the garden was brought to light by grooming the plants, paying special attention to the rare species. The landscape engineer, Tünde Thalmeiner, the expert of the rehabilitation project, tried to reconstruct the historical state of the park, respecting the strict rules of the Baroque and landscape gardens.

The English park with curved alleys lies in front of the frontispiece of the palace, to the east. The space left empty for processions was considerably reduced during the 50 years of communism, the place was taken up by flower seedlings, roses, areas with shrubs and grass. In the transformation of the garden, the designer got rid of these elements in order to regain the space for religious processions and to give a new perspective to the recently rehabilitated architectural complex, respectively to restore the atmosphere of the era at the meeting of the 19th and 20th centuries. The green space around the statue was limited, so that the exceptional work of art can be studied in the smallest detail.

In the northern part of the palace and the western part of the cathedral, the landscaped garden with curved alleys and benches, existing from the beginning, was preserved. The trees in this part are not very old, but among them you can discover valuable and exemplary species of exceptional beauty. In 2020, a biblical garden was arranged in this area; with the round and rectangular seedlings arranged symmetrically, it reminds of the puritanical simplicity of the monastic gardens. Besides pomegranate and fig trees, vine stalks and exotic plants placed in pots, different varieties of cereals, aromatic and utilitarian plants, respectively flowers with bulbs mentioned in the Old and New Testament are now planted here.

Walking down the alley behind the north wing of the palace in a westerly direction, on the left, there is an amphitheater with an outdoor scene in the middle of it. It is a modern construction, but as it is suitable for summer programs and outdoor events, during the rehabilitation works, this construction was saved from demolition. In the southern part of the palace, the lyre shaped hedge pays



homage to the glory era of classical music in Oradea, when the orchestra of the court of Bishop Adam Patachich was under the direction of leading figures such as Michael Haydn and Carl Ditters von Dittersdorf.

The terraced structure on the western side of the park remained intact, but at its base, instead of the old round plot, a Baroque-style hedge maze has been arranged, which can be admired from the stairs that connect this plan with the next upper terrace. The fact that the visitor has the opportunity to walk on alleys named after famous clerics in Oradea who put their entire life and activity in the public service gives a unique character to the park. The rehabilitation project of the Episcopal Palace garden was drawn up by architect Anikó Király and landscape engineer Tünde Thalmeiner, and was executed by the French landscape expert Tancrede Jules Baudet, assisted by Timea Kleszken a landscape engineer.

The investment includes a number of non-infrastructure, but natural heritage protection developments, such as:

- publications for the presentation, education and promotion of the natural heritage (study book and brochure);
- IT applications: web page, info desk and phone application;
- machinery and equipment for the conservation and care of the natural heritage, which largely use environmentally friendly resources;
- a solar charging station;
- purchase of state-of-the-art diagnostic equipment;
- separate collection and recycling of green waste (in the form of compost and mulch).

**Going beyond the infrastructure intervention for the protection of the natural heritage in the directly affected area, the indirect result of the tender is to improve the knowledge and scientific basis of the EU environmental policy, to promote the sustainability of the settlement, to preserve and restore biodiversity.**

**Due to its location, the impact of the the dendrological park renewal is mainly reflected in the improvement of the conservation status of the species, habitats or ecosystems related to the urban environment, as well as in the provision of ecosystem services.**

The total extent of the area directly affected by the infrastructure investment is 5.79 ha, of which buildings: 0.6 ha, undeveloped, landscaped area: 5.19 ha.

In order to determine the environmental impacts of the tender and to follow up the results of the investment, two different parts of the city were identified in the immediate urban environment of the dendrological park:

- the historic city center of Oradea (440.9 ha)
- the Rogerius district of blocks of flats (251.6 ha)

**The Historic City Center of Oradea urban ensemble**, with the code LMI BH-II-aA-01036, includes almost entirely the surface of the medieval and premodern city, overlapping in whole or in part the historic districts of Oraşul Nou, Subcetate and Velenţa on the left bank of Crişul Repede, respectively Olosig on the right bank of it.

The phenomenon of rapid urbanization during the years 1870-1914, which decisively determined the image of the ensemble, was manifested by the doubling, in a short time, of the number of city buildings in the area in question. The period 1880-1918 - decisive for the urbanism and architecture of the historic center - is characterized by imposing clear rules of urbanism, largely recycling the previously built perishable and more modest (Baroque and Classicist) background, the densification of the built fund, sometimes by unifying plots, the increase of the height regime of the buildings, especially in the historic center and on the Republicii Street, the appearance of some continuous street fronts, the diversification of building functions, the appearance of the main representative public administrative buildings, the arrangement of the banks of the Crişul Repede river.

From a stylistic point of view, most of the buildings in the Historic City Center urban ensemble are tributary to the great European art currents: eclectic, historicizing and secession. The vast majority of them were built in an eclectic style with dominant neoclassical elements, among which the most important are the public buildings. The dominant architecture of the area, that of 1880-1914, is part



of the art of 1900, which we find in the Central European space, in the architectural current of eclecticism and secession encountered in Austria and Hungary.

Within the ensemble we find historical and architectural buildings, built in styles such as: Renaissance (Oradea Fortress), Baroque (Basilica Minor – the Roman Catholic Cathedral of The Assumption of the Blessed Virgin Mary, the Episcopal Palace, the Row of Canons, the Moon Church, Saint Ladislaus Church, Church St. Nicholas, the Hussars' Barracks, the Roman Catholic Church in the Fortress), romantic / historizing (the City Hospital, the Ursuline Monastery Ensemble), classicist (the Capuchin Monastery Complex), eclectic (the State Theater, the Bazaar, the City Hall, the Finance Palace, Oradea Train Station, the Neuropsychiatric Hospital, the Rimanoșy Kalman Sr. Palace, the Rimanoșy Hotel, the Central House of Savings Palace, the Austro-Hungarian Bank (current headquarters of the National Bank of Romania, the Commercial Hall ...) and secession (the Black Eagle Complex, the Adorjan I and II Houses, the Poynar House, the Astoria Hotel - Sztarill Palace, the Transilvania Hotel, the Ulman Palace, the Stern Palace, the Moskovits Palace, the Apollo Palace).

Given the conditions provided by the configuration of the built fund, there is a relatively small number of green spaces and parks within the ensemble, and the prospect of building new ones is very low. The oldest park was Rhédey Park on the southwestern edge of the city, on a land donated in 1804 by the head of Bihor county at that time, Lajos Rhédey, and then extended in 1898 over the Bulgarian gardens (now Bălcescu Park). In Olosig, the only public park was the one arranged in front of the County Palace, in the Széchenyi Square (now Traian Park) in the middle of the 19th century. After 1887, the works for the development of the Schlauch Park, the Bunytay Park and the Dóry Island (now Brătianu Park) began, and they lasted until 1902. In 1890 the execution of the development of the Milenar Park (now the Libertății Square) on the right bank of the Crișul Repede river began.

The only park with a more significant area, arranged after 1989, is the Mihai Viteazul Park / Olosig Park, which stretches over the former Olosig cemetery, between the Historical Ensemble and the Rogerius district.

**The Rogerius district** - named after the Roman Catholic canon who described the invasion of the Tartars in the book entitled *Carmen Miserable* - is the largest district of blocks of flats in Oradea, located in the western part of the city, adjacent to the industrial area, stretching between the banks of the Crișul Repede river, the E671 international road, the city bypass and the Oradea - Cluj Napoca railway. It was built in several stages and consists of several subzones, depending on the stages of construction and the road boundaries.

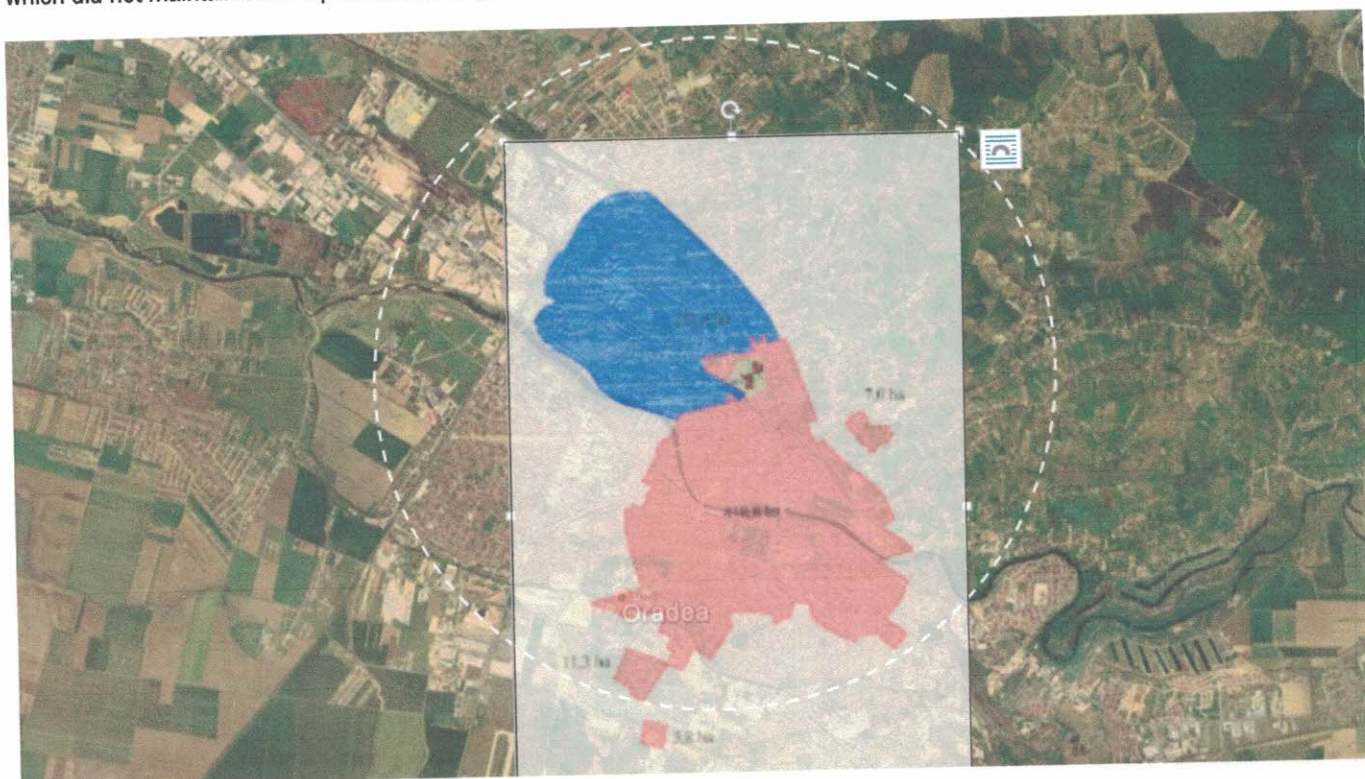
The base of the future neighborhood was laid in 1965/1966, by building blocks on the free land of the outskirts of the city, in the western part, on the right bank of the Crișul Repede, which were completed in 1970. On a vacant lot, apartment blocks were designed, arranged in an orderly manner, with green spaces between them, with new streets and driveways, schools and kindergartens. These are the blocks of flats on the Dacia Blvd. (the tower blocks, the blocks between Posada Alley - Șelimbărului - Dacia Blvd. – Rogerius Alley), Transilvaniei street, but also the new Children's Hospital and Polyclinic on Corneliu Coposu street. The first blocks of flats were built between Dacia Blvd. and Aluminei Street, and they would form the basis of the new neighborhood located between Dacia Blvd. and the right bank of the Crișul Repede.

The neighborhood continued to develop, new blocks of flats were built on the bank of the Crișul Repede river, between it and the Sovata Street, where the tower blocks alternate with four-storey blocks. There are green spaces, driveways and parking spaces around the blocks. Subsequently, between the tower blocks or next to them, 4-storey blocks were built, thickening the built fund. The right bank of the Crișul Repede, with the tower blocks, is one of the successes of the communist period, creating a valuable perspective.

After 1978, the area between Dacia Street – Sovata Street - Crișul Repede bank continued to be developed, 4-storey blocks of flats being built on the free spaces, the built-up area being thickened here as well.



A major intervention in the 1980's was the continuation of the development of the block of flats by demolishing the existing houses and building 4-storey blocks of flats, in the area of Dacia - Sovata, Aluminei, Progresului / Sf. Ap. Andrei Streets, Decebal Blvd. The section of Decebal Blvd. between the bridge and Dacia Blvd. was created in the 1980's, the new artery being drawn over the old streets, thus modifying the old configuration of the area. The blocks built in the new neighborhood are much thicker, with less space between them, they are arranged along the streets, forming inside yards, where in some cases other blocks have been crowded. The urban configuration of the neighborhoods is different from that of the previous decade, less airy. Along Dacia / 6 Martie and Decebal boulevards, blocks with 8-9-10 floors were built to create imposing boulevards. The crossroads between the two arteries is marked by 10-storey blocks of flats. A new street, a breakthrough between Decebal Blvd. and Ostașilor/Coposu Street was opened near the Olosig cemetery. Between the current Dacia - Menumorut - Decebal boulevards, new blocks of flats were built, new streets, which did not maintain the old plot. These neighborhoods were also built up by demolishing old houses.



As a result of the urban anthropogenic general, economic and industrial activities, the share of paved surfaces has increased significantly, while the number and size of natural green spaces have decreased in parallel. The remaining vegetation-covered areas shape the specific climate of the city to the greatest extent, have a beneficial effect on the temperature of their surroundings, and improve human comfort, air pollution, and the condition of the atmosphere. Increased urbanization has highlighted the awareness of the importance of the natural environment in the urban area.

The impacted areas were determined partly due to the urban and historical similarity (the Baroque Palace Dendrological Park and the historical part of Oradea are located in a protected monumental environment) and partly due to the highly urbanized nature of the Rogerius district.

The dendrological park is an important shaper of the urban environment, it has many conditioning effects on the ecology of the city.

Direct and indirect environmental impacts of the investment on the urban ecosystem:

- a positive impact on the environmental condition of the city and on the human comfort;
- creation of habitats for the fauna, increase of the biodiversity of the settlement;



- the surface area of the vegetation has an effect on the amount of irradiation, the direct radiation of the surface is reduced by the vegetation areas, while the proportion of diffuse radiation increases;
- a significant amount of dust settles on the surface of the leaves of woody stem plants;
- the vegetation has a strong noise filtering property;
- the roots of some species have a beneficial effect on soil pollution by incorporating toxic microelements;
- green surfaces increase the humidity of the city air by evaporation;
- rainfall retention, more ideal water balance and higher moisture content;
- mitigation of the local temperature decrease (evaporation is an endothermic process, involving heat removal) and of the urban insulation phenomenon;
- reducing the greenhouse effect through oxygen production and CO<sub>2</sub> sequestration;
- interaction between flowering plants and pollinators;
- the dendrological park provides protection for the birds and fauna of the wider area;
- webcams for bird watching.

The direct and indirect effects on the target areas will be monitored on the basis of an independent environmental indicator system for 5 years after the closure of the project:

	Baroque Palace Dendrological Park		Historic city center and Rogerius district	
	constant	regular	constant	regular
monitoring the condition of the plants	X			X
monitoring the condition of the valuable plants *	X			X
regular monitoring of air quality [CO <sub>2</sub> , particulate matter content PM <sub>2.5</sub> and PM <sub>10</sub> , VOC (Volatile Organic Compounds) gases]	X			X
ensuring the habitat of bird and animal species of community importance	X			
monitoring of bird and animal species of community importance**		X		X

\*- in particular the condition of *Sequoia gigantea* located outside the area of the dendrological park and which are particularly protected

\*\* - especially those belonging to the *Strigiformes*, *Chiroptera*, *Falconiformes*, *Picidae*, *Turdidae*, *Fringillidae*, *Sittidae* families.

The trees, shrubs and flowers greatly enhance biodiversity by hosting a wealth of bird species, arthropods, microorganisms, fungi and other plant species.

At the end of the project, after the handover of the work area, the increased enrichment of the bird and fauna will be facilitated by external bird feeders, natural lairs and artificial nesting boxes, plant litters, and useful nesting places for pollinators.

During Spring of 2021 a local bird monitorization group helped the dendrological park of Oradea to observe and identify the local birds of this area. The following table includes these:

	Name	Migratory	Probably migratoring	Nesting
1	<i>Accipiter nissus</i>		*	
2	<i>Aegithalos caudatus</i>			*
3	<i>Asio otus</i>			*
4	<i>Athene noctua</i>			*



5	<i>Cardelis cardelis</i>		*	
6	<i>Cardelis chloris</i>		*	
7	<i>Columba palumbus</i>		*	
8	<i>Cyanistes caeruleus</i>			*
9	<i>Dendrocopos major</i>			*
10	<i>Dendrocopos syriacus</i>			*
11	<i>Erithacus rubecula</i>			*
12	<i>Falco tinunculus</i>		*	
13	<i>Fringilla coelebs</i>		*	
14	<i>Garrulus glandarius</i>		*	
15	<i>Motacilla alba</i>	*		
16	<i>Parus major</i>			*
17	<i>Passer domesticus</i>			*
18	<i>Phoenicurus ochruros</i>	*		
19	<i>Phylloscopus collybita</i>	*		
20	<i>Picus viridis</i>			*
21	<i>Poecille palustris</i>			*
22	<i>Serinus serinus</i>	*		
23	<i>Sitta europea</i>			*
24	<i>Streptopelia decaocto</i>			*
25	<i>Strix aluto</i>			*
26	<i>Sturnus vulgaris</i>	*		
27	<i>Sylvia atricapilla</i>	*		
28	<i>Sylvia curruca</i>	*		
29	<i>Troglodytes troglodytes</i>		*	
30	<i>Turdus merula</i>		*	



During autumn we also spotted a few Hedgehog families, but unfortunately then couldn't take any picture of them. In 2022 we were lucky enough to spot them a few more times during afternoon, their number has been increased and we are very pleased by this. Another great spotted specie is the long-lost-known dark Squirell. To increase their presence in the garden, we introduced a few more walnut bushes.



The following basic data are available for monitoring the condition of the plants:

Row	Plot	No.	Name	Trunk diameter	Age	Estimated Year of planting	Height	Condition
1	1	1	<i>Taxus baccata</i>	139 cm	110	1908		Healthy
2	1	15	<i>Taxus baccata</i>	106 cm	110	1908		Trimmed*
3	1	16	<i>Magnolia soulangiana</i>	107 cm	90	1928	8,5 m	Trimmed*
4	1	17	<i>Magnolia soulangiana</i>	80 cm	90	1928	12,4 m	Trimmed*
5	1	18	<i>Magnolia soulangiana</i>	75 cm	90	1928	6,9 m	Trimmed*
6	1	19	<i>Magnolia soulangiana</i>	117 cm	90	1928	8,8 m	Trimmed*
7	2	19	<i>Taxus baccata</i>	45-60-89 cm	110	1908		Trimmed*
8	3	8	<i>Ginkgo biloba</i>	58 cm	20	1998	12,9 m	Healthy
9	4	21	<i>Corylus columa</i>	232 cm	100	1918	18,1 m	Anchored
10	5	7	<i>Taxus baccata</i>		110	1908		Trimmed*
11	6	1	<i>Quercus robur</i>	450 cm	180	1838	29 m	Anchored



Row	Plot	No.	Name	Trunk diameter	Age	Estimated Year of planting	Height	Condition
12	6	6	<i>Gymnocladus dioicus</i>	136 cm	60	1958	16 m	Healthy
13	6	7	<i>Gymnocladus dioicus</i>	71 cm	60	1958	13,6 m	Healthy
14	8	3	<i>Gymnocladus dioicus</i>	56 cm	60	1958	9 m	Healthy
15	9	1	<i>Quercus robur</i>	311 cm	125	1893	23,8 m	Healthy
16	9	44	<i>Gymnocladus dioicus</i>	126 cm	55	1963	21,6 m	Healthy
17	9	45	<i>Gymnocladus dioicus</i>	135 cm	54	1964	22 m	Healthy
18	14	1	<i>Magnolia kobus</i>	70 cm	90	1928	9,1 m	Trimmed*
19	14	2	<i>Magnolia kobus</i>	105 cm	90	1928	13 m	Trimmed*
20	14	3	<i>Magnolia kobus</i>	93 cm	90	1928	8,1 m	Trimmed*
21	14	4	<i>Magnolia soulangiana</i>	107/107/104 cm	90	1928	11,5 m	Trimmed*
22	14	5	<i>Magnolia kobus</i>	100 cm	90	1928	10,5 m	Trimmed*
23	14	6	<i>Magnolia soulangiana</i>	97/68 cm	90	1928	8 m	Healthy
24	14	7	<i>Magnolia soulangiana</i>	84/60 cm	90	1928	7,9 m	Healthy
25	14	8	<i>Magnolia soulangiana</i>	130 cm	90	1928	8,5 m	Healthy
26	16	3	<i>Corylus columa</i>	250 cm	100	1918	21,6 m	Healthy
27	25	39	<i>Ginkgo biloba</i>	205 cm	100	1918	19 m	Healthy
*28	32	44	<i>Salix babilonica</i>	250 cm	110	1908	15 m	Healthy
29	32	31	<i>Acer sacharinum</i>	200 cm	90	1928	22 m	Healthy
30	34	1	<i>Aesculus hippocastanum</i>	313 cm	140	1878	21,5 m	III
31	34	2	<i>Aesculus hippocastanum</i>	214 cm	100	1918	16,6 m	III
32	47	1	<i>Quercus rubra</i>	370 cm	150	1868	24 m	Healthy
33	27	3	<i>Liquidambar stryaciflua</i>	15 cm	6	2012	3,8 m	Healthy
34	28	1	<i>Magnolia kobus</i>			2018	10 m	Healthy
35	28	3	<i>Magnolia kobus</i>			2018	11,2 m	Healthy
36	28	7	<i>Magnolia kobus</i>			2018	12 m	Healthy
37	28	8	<i>Magnolia kobus</i>			2018	12 m	Healthy
38	28	9	<i>Magnolia kobus</i>			2018	10,6 m	Healthy
39	28	10	<i>Magnolia kobus</i>			2018	11,5 m	Healthy
40	39	1	<i>Aesculus hippocastanum</i>			2018	16 m	III
41	39	2	<i>Aesculus hippocastanum</i>			2018	14,5 m	III
42	39	3	<i>Aesculus hippocastanum</i>			2018	17,6 m	III
43	39	4	<i>Aesculus hippocastanum</i>			2018	17,4 m	III
44	40	1	<i>Aesculus hippocastanum</i>			2018	22,2 m	III
45	40	2	<i>Aesculus hippocastanum</i>			2018	22 m	III
46	40	3	<i>Aesculus hippocastanum</i>			2018	15,1 m	III
47	40	4	<i>Aesculus hippocastanum</i>			2018	18,8 m	III
48	-	-	<i>Sequoia gigantea</i>	340 cm	140	1878		Healthy
49	-	-	<i>Sequoia gigantea</i>	295 cm	140	1878		III

Row	Plot	No.	Name	Trunk diameter	Age	Estimated Year of planting	Height	Condition
50	-		<i>Sequoia gigantea</i>	370 cm	140	1878		No information

\*-trimmed, according to the dendrological study recommendations

The species of *Aesculus hippocastanum* suffers from an invasion of the harmful insect called *Cameraria ohridella*. The species defoliates the chestnut, one of the favorite ornamental trees in Romanian cities but also in Europe. The moth produces mines in the parenchyma of chestnut or maple leaves, leading to their drying since the 1975s. For periodic analysis we use the Fakopp ArborSonic tomograph.

In august of 2021 a local newspaper initiated a conversation about the giant sequoias from Oradea and their health status, we used the Fakopp Arborsonic tree tomograph to scan their trunk and also analysed the sight situation. After the article was written the representatives of the local mayor came forward to discuss a possible collaboration between the representatives of the dendrological garden and the school representatives, for a scientific supervision, monitorization and professional interventions if one these endangered sequoias would show any health danger to their surroundings. This collaboration will open oportunities to analyze these wonderfull species which are really rare in Romania, to be exact, there are only eight trees (and three out of eight are located in Oradea, those who were once part of the dendrological garden.)

\*Between 01.06.2022-01.06.2022 there were some severe storms during summer and early spring of 2022, when the Weeping Willow have been affected by these storms, a big part of it's crown fell down.

The dendrological species present in this area, randomly listed (01.06.2020):

- |  |  |                                      |
|--|--|--------------------------------------|
| 1. <i>Acer campestre</i>                           | 22. <i>Forsythia x intermedia</i>        | 44. <i>Pinus nigra</i>               |
| 2. <i>Acer negundo</i>                             | 23. <i>Fraxinus excelsior</i>            | 45. <i>Platanus x acerifolia</i>     |
| 3. <i>Acer palmatum</i>                            | 24. <i>Fraxinus ornus „Mecsek”</i>       | 46. <i>Populus nigra „Italica”</i>   |
| 4. <i>Acer platanoides</i>                         | 25. <i>Gingko biloba</i>                 | 47. <i>Prunus cerasifera</i>         |
| 5. <i>Acer platanoides Globus</i>                  | 26. <i>Gymnocladus dioicus</i>           | 48. <i>Prunus amygdalopersica</i>    |
| 6. <i>Acer platanoides Krimson King</i>            | 27. <i>Hibiscus syriacus</i>             | 49. <i>Prunus cerasifera „Nigra”</i> |
| 7. <i>Acer pseudoplatanus</i>                      | 28. <i>Ilex aquifolium</i>               | 50. <i>Prunus laurocerassus</i>      |
| 8. <i>Acer sacharinum „Laciniatum Wierii”</i>      | 29. <i>Juglans regia</i>                 | 51. <i>Quercus robur</i>             |
| 9. <i>Aesculus hippocastanum</i>                   | 30. <i>Juniperus comunis</i>             | 52. <i>Quercus robur fastigiata</i>  |
| 10. <i>Betula pendula</i>                          | 31. <i>Juniperus cinensis</i>            | 53. <i>Quercus rubra</i>             |
| 11. <i>Caragana pendula</i>                        | 32. <i>Koelreuteria paniculata</i>       | 54. <i>Robinia pseudoacacia</i>      |
| 12. <i>Catalpa bignonioides</i>                    | 33. <i>Liquidamambar stryaciflua</i>     | 55. <i>Rosa sp.</i>                  |
| 13. <i>Cedrus atlantica</i>                        | 34. <i>Magnolia grandiflora</i>          | 56. <i>Salix babylonica</i>          |
| 14. <i>Cedrus deodara</i>                          | 35. <i>Magnolia kobus</i>                | 57. <i>Spiraea japonica</i>          |
| 15. <i>Cedrus libani</i>                           | 36. <i>Magnolia soulangeana</i>          | 58. <i>Tamarix tetrandra</i>         |
| 16. <i>Celtis poccidenthalis</i>                   | 37. <i>Malus domestica</i>               | 59. <i>Taxus baccata</i>             |
| 17. <i>Chamaecyparis lawsoniana</i>                | 38. <i>Malus purpurea</i>                | 60. <i>Thuja occidenthalis</i>       |
| 18. <i>Chaenomeles japonica</i>                    | 39. <i>Morus nigra „Pendula”</i>         | 61. <i>Thuja orienthalis</i>         |
| 19. <i>Chamaecyparis occidenthalis</i>             | 40. <i>Phyladelphus coronarius</i>       | 62. <i>Tilia cordata</i>             |
| 20. <i>Corylus columa</i>                          | 41. <i>Photinia fraserii „Red Robin”</i> | 63. <i>Tilia tomentosa</i>           |
| 21. <i>Cupressocyparis leylandii „Silver dust”</i> | 42. <i>Phyladelphus coronarius</i>       | 64. <i>Tilia platiphylos</i>         |
|  | 43. <i>Picea pungens „Argentea</i>       |                                      |

In autumn of 2020, the dendrological garden of Oradea has extended it's dendrological collection with almost forty more shrubs and trees. They are the nexts:

- |                              |   |                                      |
|------------------------------|---|--------------------------------------|
| 1. <i>Abies nordmanniana</i> | 2. <i>Acer platanoides “Crimson Sentry”</i> | 3. <i>Acer rubrum</i>                |
|                              |   | 4. <i>Berberis media x red jewel</i> |



- |   |   |   |
|---|---|---|
| 5. <i>Berberis thunbergii</i> "Golden pillar" | 17. <i>Juniperus x media</i> "Mint julep" | 29. <i>Rhododendron</i> "Aladdin scout" * |
| 6. <i>Berberis thunbergii</i> "Atropurpurea"  | 18. <i>Kerria japonica</i>                | 30. <i>Rosa canina</i>                    |
| 7. <i>Carpinus betulus</i>                    | 19. <i>Laurus nobilis</i>                 | 31. <i>Ruscus aculeatus</i>               |
| 8. <i>Cedrus atlantica</i>                    | 20. <i>Liriodendron tulipifera</i>        | 32. <i>Salix caprea</i>                   |
| 9. <i>Cedrus libani</i>                       | 21. <i>Magnolia grandiflora</i>           | 33. <i>Sorbus aucuparia</i>               |
| 10. <i>Cercidiphyllum japonicum</i>           | 22. <i>Mahonia x media</i>                | 34. <i>Spiraea japonica</i> "Goldflame"   |
| 11. <i>Euonymus japonicum</i> "aurea"         | 23. <i>Metasequoia glyptostroboides</i>   | 35. <i>Stipa tenuissima</i> "Ponytails"   |
| 12. <i>Fagus sylvatica</i> "Dawyck purple"    | 24. <i>Olea europaea</i>                  | 36. <i>Syringa vulgaris</i>               |
| 13. <i>Ficus carica</i>                       | 25. <i>Phoenix dactylifera</i>            | 37. <i>Weigela florida</i>                |
| 14. <i>Hamamelis x intermedia</i>             | 26. <i>Picea glauca</i> "Conica"          | 38. <i>Weigela florida</i> "Alexandra"    |
| 15. <i>Hydrangea lime light</i>               | 27. <i>Prunus serulata</i> "Kansan"       | 39. <i>Weigela florida</i> "Variegata"    |
| 16. <i>Ilex crenata variegata</i>             | 28. <i>Punica granatum</i>                |   |

\*Some species (for ex: *Cercidiphyllum japonicum* and *Rhododendron Aladin scout*) didn't survive the cold weather of winter. Later on, in may 2022 another two examples of *Rhododendrons* has benn planted which will receive protective equipment during winter of 2022.

The rest of planted trees and ornamental shrubs has been adapted very well, some of them already growing it's fruits, for example *Sorbus aucuparia*, which also helped the local birds with food supplies. Dried seeds were also positioned in many points of the garden, for the same purpose.

Between 1st of June 2021- 1st of June 2022 the dendrology collection has been extened with new tree and shrub species such as:

- |                               |   |   |
|-------------------------------|---|---|
| 1. <i>Abies concolor</i>      | 10. <i>Populus tremura</i>                | 19. <i>Zyzyphus spina-christi</i>       |
| 2. <i>Abies pinsapo</i>       | 11. <i>Prunus serrulata</i> „Kanzan"      | 20. <i>Lycium barbarum</i>              |
| 3. <i>Cercis siliquastrum</i> | 12. <i>Taxodium distichum</i>             | 21. <i>Passiflora caerulea</i>          |
| 4. <i>Davidia involucreta</i> | 13. <i>Rosa floribunda</i>                | 22. <i>Coffea arabica</i>               |
| 5. <i>Fagus sylvatica</i>     | 14. <i>Rosa</i> "David Austin"            | 23. <i>Hydrangea</i> sp.                |
| 6. <i>Larix decidua</i>       | 15. <i>Coryllus avellana</i>              | 24. <i>Castanea sativus</i>             |
| 7. <i>Parotia persica</i>     | 16. <i>Salix integra</i> 'Hakuro-Nishiki' | 25. <i>Lagerstromenia indica</i>        |
| 8. <i>Pinus pinea</i>         | 17. <i>Rhus typhina</i>                   | 26. <i>Metasequoia gliptostroboides</i> |
| 9. <i>Pinus walachiana</i>    | 18. <i>Burgmansia</i> sp.                 |   |



### The beetle fauna

In the case of the species that can appear in the indicator areas were found a few nearby the oldest oak trees of the garden mostly these species were:

- *Cerambyx scop*
- *Cetonia aurata*\*
- *Lucanus cervus*
- *Oryctes nasicornis*

\**Cetonia aurata* is the common european rose chafer was really active during the spring blooming, mostly on *Photinia fraseri* „Red Robin” , *Viburnum* sp. and *Spirea japonica* species. Same activity could be observed in Spring of 2022.



*Cerambyx scop*, *Lucanus cervus*  
and *Oryctes nasicornis*



*Cetonia aurata*



*Oryctes nasicornis*

Between 1st of June 2021 and 1st of June 2022 the beetle fauna didn't show any new specie, further observations will continue.

**Mushrooms**, most of these fungies were found in october/november, after a 7 to 10 days of autumnal rain in the area of the dendrological garden. Hopefully during winter other spores will bring new species next year so the mushroom collection will grow. Right now, we've discovered seven types, these are:





*Coprinus*



*Paralepista flaccida*



*Phallus impudicus*



*Mycena galericulata*



*Agaricus bisporus var albidus*



*Agaricus bisporus var. avellanus*



*Kuehneromyce*

Near the Biblical garden, just behind the Olive tree, a really interesting circling phenomenon could've been observed since Spring of 2022 known as: The fairy rings. Fairy rings are circular areas of abnormal turf growth that are most commonly found on lawns where soils have high levels of organic matter, and in areas where trees have recently been removed.





**Weeds, perenial-, shade -, wild-; medicinal plants.**

Most of our medicinal plants were introduced in 2020, after the „Biblical Garden” concept was made. This area includes different plants, from different botanical families such as : grapes (*Vitis vinifera*), garlic (*Alium scorodoprasum*), Fig trees (*Ficus carica*), flowers including cornflower (*Centaurea cyanus*), lilies (*Lilium candidum*), Gladiolus.

Medicinal plants suc as: pepermint (*Mentha piperita*), cotton lavender (*Santolina chamaecyparissus*), lavender (*Lavandula angustifolia*), lemon balm (*Melissa officinalis*). Another interesting task of this Biblical garden, was creating a patch of colour for the polinators, that's why we've decided to plant mustard (*Brassica nigra*) and other vivid coloured flowers like lilies (*Lilium candidum*), flax (*Linum usitatissimum*), love-in-a-mist (*Nigella damascena*). These bushy medicinal plants also gave home for countless bugs,polinators reptiles throught the spring-summer season.

During the observational period, the biblical garden became more diverse including new medicinal plants in comparison to other year. There is (Rosa canina), hyssopus sp, sage( *salvia officinalis* ), rosemary (rosmarinus), Coneflowers (*Echinacea sp*),basil (*Ocimum basilicum*) tuberoses (*Polyanthes tuberosa*) etc.



*Vespa cabro* on *Echinacea sp.*



*Mantis religiosa* couple in *Lavanda sp. shrub*



*Sphecus speciosus*

Therefore, the original vegetation of the garden and it's surroundings are filled with countless wildflowers and weeds, whom seeds are naturally transported by the wind from the neighborhood areas, but also are naturally present in this area for decades. Among these wild flowers we can mention: *Achillea cartilagiana*, *Amaranthus albus*, *Armoracia rusticana*, *Bellis perenis*, *Carex hitra*, *Cichorium intybus*, *Cosmos*, *Urtica dioica*, *Trifolium repens*.



*Cichorium intybus*



*Ficaria verna*



*Trifolium repens*



*Lamium purpureum*

Near the Biblical Garden there's a shady part of the garden, where authentic trees of this region are the most dominant ones Acer, Quercus, Aesculus, Abies and others. Under these exemplares many ferns (*Feriga*), poison ivy (*Hedera helix*), common nettle (*urtica dioica*), common daisies (*Bellis perenis*) and also a few endangered spring flowers such as sweet viola (*Viola odorata*), snowdrop (*Galanthus*), purple archangel (*Lamium purpureum*) can be found. Every season of the year has something to show us in this dendrological area.



During the observation period in early spring of 2021 we were able to notice a new native species such as: the ground ivy (*Glechoma hederacea*) and for the first time after years of disappearance a native spring flower which is highly endangered the *Crocus heuffelianus*.



*Glechoma hederacea*



*Crocus heuffelianus*

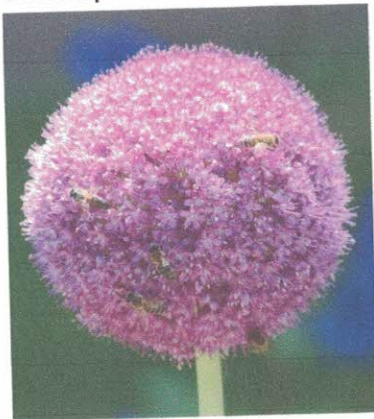


*Corydalis solida*



*Galanthus*  
(endangered)

In autumn of 2020, the dendrological park, received a modern concept that also will help the biodiversity ex: bees, butterflies and other pollinators; to keep and sustain their yearly duty. That's why one of the shadiest part close to the Biblical garden received a perennial plant collection including low-light plants (*Hosta*, *Feriga*, *Astilbe*, *Hemerocallis*, *Helleborus*), perennial and medicinal plants (*Echinacea* sp. *Dicentra* sp. *Delphinium*, *Salvia* sp, *Roses*, ), ground covers, and spring bulbs (*Frittilaria* imp., *Allium giganteum*, *Tulipa agenensis*). The number of different pollinators were increasing in the beginning of 2021 when over seven thousand tulips began to bloom, then different perennials were also hosting these kind of insects. Most visitors took time to admire the bees work.



*Apis melifera*



*Cupido minimus*



*Vanessa cardui*



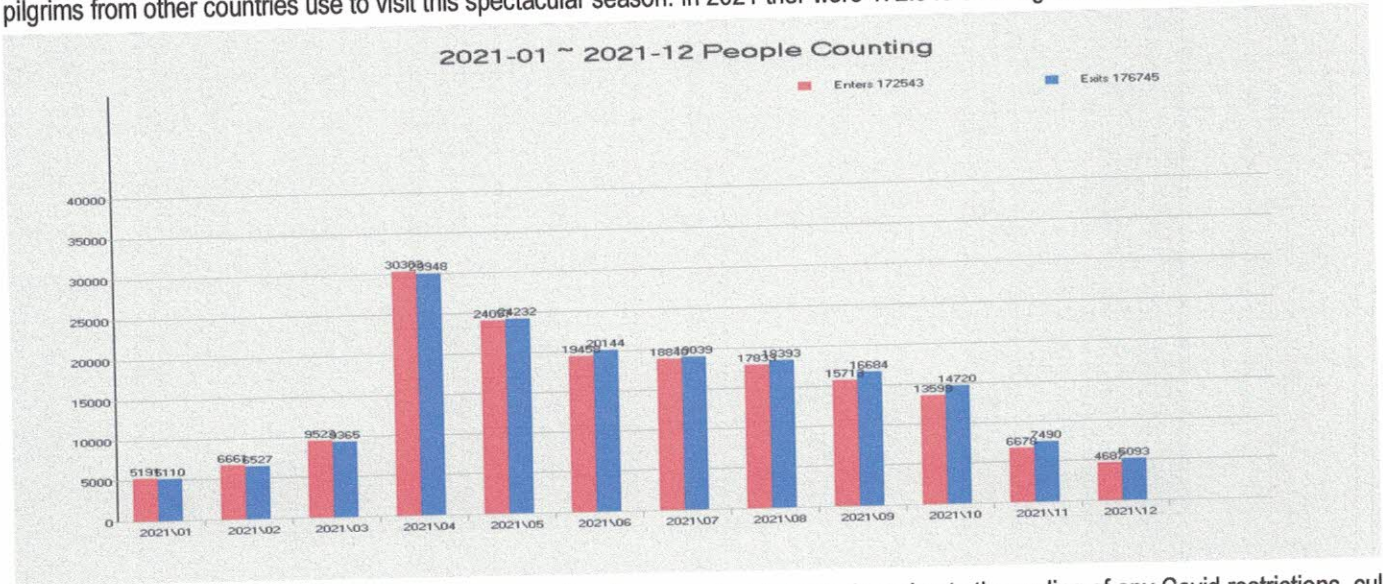
*Apis melifera*

**In 2022 a new butterfly species has been spotted near the biblical garden *Papilio machaon* also known as Old World Swallowtail.**

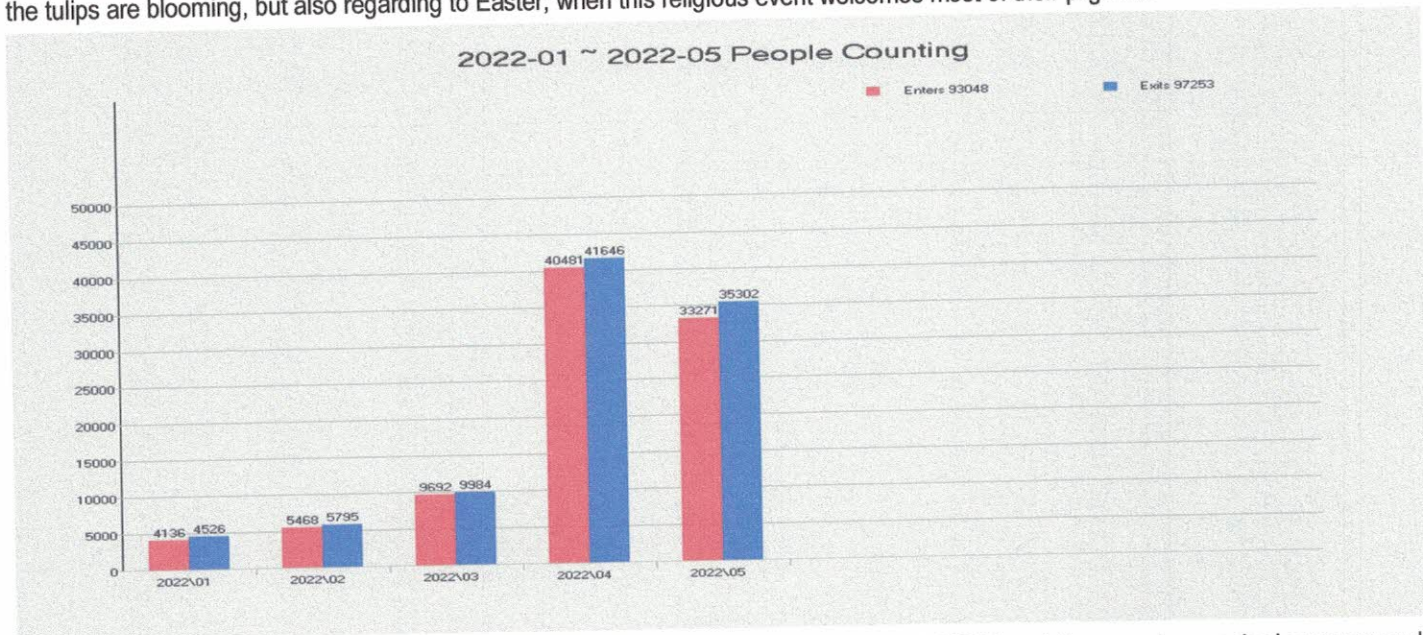
The dendrological garden of Oradea will provide a healthy ecosystem for these native insects to survive and host them. Furthermore, we will try to provide as many new information about these beautiful creatures as possible, that students (at any age), adults and also professionals will be able to study and observe them.



Between 01.06.2020 and 01.06.2021 the number of the visitors increased significantly, the highest number of visitors (30.303) can be seen in April 2021, when the Magnolia tree blooming begins in front of the Bishopric palace. Every year many local citizens but also pilgrims from other countries use to visit this spectacular season. In 2021 ther were 172.543 enterings and 176.745 exitors.



Since 01.06. 2021-01.06.2022 the number of visitors has been reached better values due to the ending of any Covid restrictions, cultural and social events to be held in this beautiful area. As usual, the highest numbers were visible during April when the secular Manolias, the tulips are blooming, but also regarding to Easter, when this religious event welcomes most of their pilgrims.



Until 31<sup>st</sup> of may 2022 there were 93.048 enters and 97253 exitors, as expected in April 2022 the visitors number reached a new record more than 40.000(almost 10.000 more than last year, same season).

Although, in 2021 the magnolias weren't the only wonder to see. Under these trees we've planted around seven thousand tulips, which begun to bloom right after the Magnolias, this garden became again a really popular sight between tourists but also local citizens too.





Periodically, the project partners will inform the population affected by the implementation of the project elements about the effects.

We would like to present the monitoring activities analyzing the effects by informing the residents of the settlements directly affected by the project investments (Szarvas, Békésszentandrás, Oradea) and by educating them about environmental awareness.


To do this, we take the following measures:

- the involvement of schoolchildren in the air pollution measurement and evaluation processes;
- organization of regular bird monitoring programs;
- periodic bird ringing with the involvement of specialists;
- development of an independent environmental indicator system, periodic evaluations, innovative approach;
- public announcement of the results on the application website ([www.baroque-garden.ro](http://www.baroque-garden.ro));
- joint partnership activities to review and evaluate the results and to organize environmental awareness-raising sessions in the project locations and indicator areas.

**The results of the project's impact were presented to the public in several forums. These included nature camps in the Arboretum and sessions linked to the various "Green Days", where we analysed both the measurements and the practical implementation (e.g. bird ringing). In addition to the arboretum programmes, lectures were held in the Szarvas and Békésszentandrás, mainly in educational institutions. In addition, we maintained our previous contacts with NGOs.**





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