1 Danube Delta Biosphere Reserve **2** Srebarna Nature Reserve **3** Kalimok-Brushlen Protected Site **4** Rusenski Lom Nature Park **5** Persina Nature Park **6** Djerdap National Park **7** Gornje Podunavlje Special Nature Reserve **8** Kopački rit Nature Park **9** Lonjsko Polje Nature Park **10** Duna-Dráva National Park **11** Duna-Ipoly National Park **12** Dunajské luhy Protected Landscape Area **13** Záhorie Protected Landscape Area **14** Donau-Auen National Park **15** Donauauwald Neuburg Ingolstadt

TRANS-BOUNDARY MANAGEMENT CONCEPT

FOR THE KARAPANCSA (HU) / KARAPANDZA (SRB)

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Programme co-funded by the EUROPEAN UNION

SOUTH EAST EUROPE Transnational Cooperation Programme

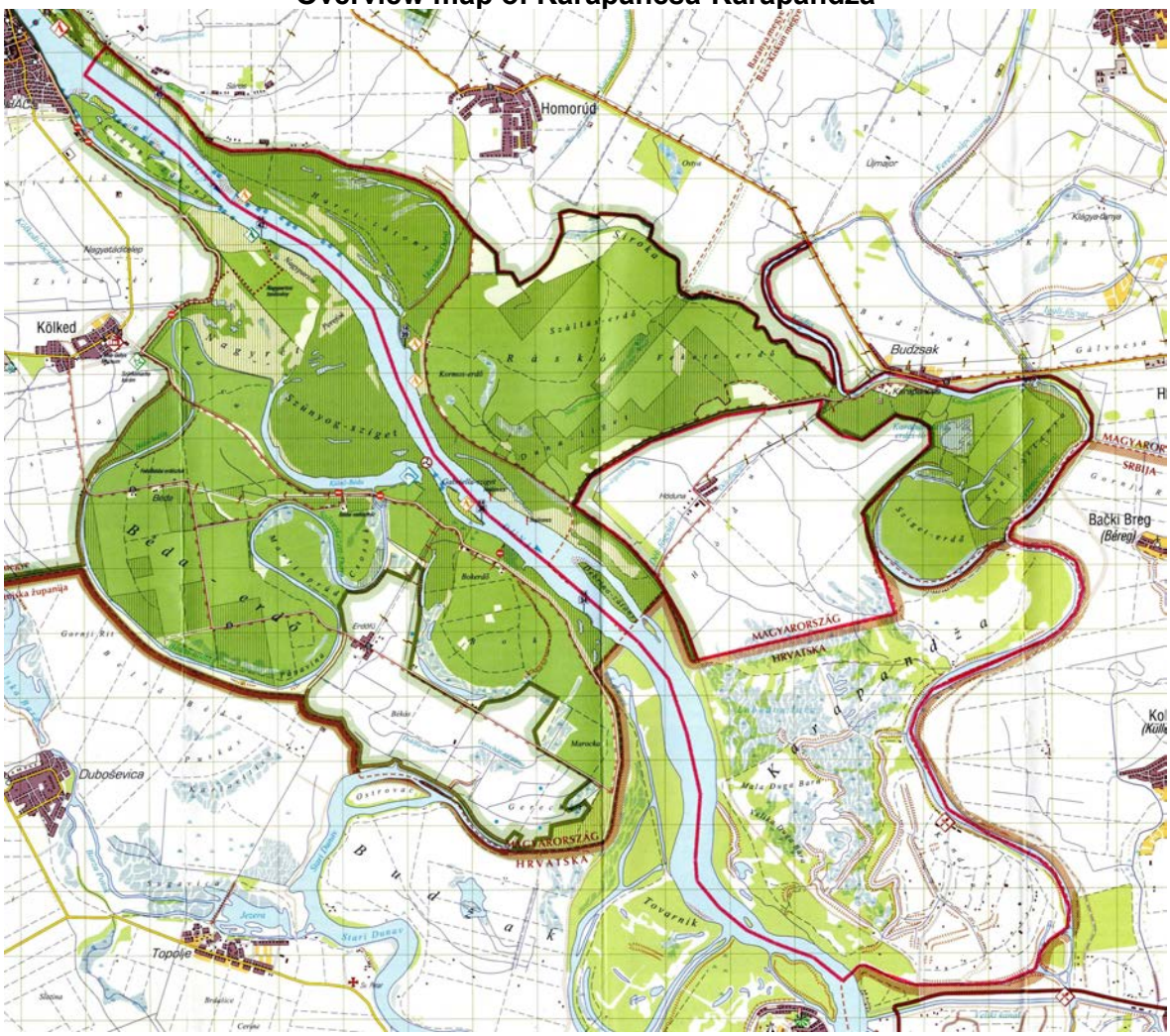
DANUBEPARKS network of protected areas

JOINT NATURE CONSERVATIONAL MANAGEMENT PLAN OF KARAPANCSA-KARAPANDŽA

Preface

The erstwhile integrate landscape of Karapancsa-Karapandža is divided with state borders since long time ago. The different use of the areas – as result of different owner status characteristics and laws – resulted diverse landscapes in Hungary and Serbia. The differences are experiancable nowadays too in many ways therefore the whole area unfortunately can not be treated as one.
Because of these basic differences we did not unified the nature conservational plans written by the managing bodies of the two countries. Of course the natural characteristics – climate, geology, water regime, flora and fauna – are very similar therefore it might be possible to simplify the descriptions of the areas but we thought the picture can be complete only if we give all the informations what we have. So finally in the following chapters, in order of flowing of the Danube, we submit the shortened management plans of the Duna-Drava National Park for Karapancsa in Hungary and the same documentation of the Gornje Podunavlje for Karapandža in Serbia.
At the end of the whole documentation a summarizing chapter stands which gives an overall view of the natural characteristics and conservational status of the area than we list the main aims of nature conservation.

Overview map of Karapancsa-Karapandža



1. Nature management plan of Karapancsa, Hungary

1.1. General information

Base data
Identifying data of the area:
name:
Duna-Dráva National Park, Karapancsa section

Number of declaring law:
7/1996. (IV. 17.) KTM

International declarations:
Ramsar site: Béda-Karapancsa
Natura 2000 sites:
Béda-Karapancsa: HUDD 10004 SPA; HUDD20045 SAC

Extension of the area:
3486 ha

Concerning administrative areas:
Baranya county: Homorúd, Mohács, Bács-Kiskun county: Hercegszántó

Competent nature conservational authority:
DD-KÖTEVIFE

Nature conservation managing body:
Duna-Dráva national Park Directorate

Centre coordinates of the area:
EOV X=67300
Y=630260

Landpart administration data

Owner/manager		**Extension (ha)**	**%**
state owned	NP managed	232,7	6,7
	managed by other bodies (mainly state forester companies)	2961,9	85
non state owned	mainly private	291,4	8,3
Landuse			
forest		2555,24	73,3
flowing water		4183,32	12
standing water		34,86	1
swamp, reed		90,64	2,6
dykes (mainly grassy)		87,15	2,5
grasslands		94,12	2,7
plough land		153,38	4,4
not cultivated (roads, buildings)		52,29	1,5

1.2. Description

1.2.1. Environmental characteristics

Climate and weather

General characteristics
The lower section of the Duna-Dráva National Park lies to South from the Sió in the border region of two climatic regions. The two regions are the Alföld and Mezőföld and the Dunántúl climatic landscape. North from Baja the middle subregion of the Alföld is determining and South from here on the Western side the effect of the Southern subregion of Dunántúl, on the Eastern side Southern subregion of Alföld is characteristic.
In the Southern subregion of the Alföld and Mezőföld climatic region are the hottest summers in Hungary but here was registered the coldest weather too (at Baja, -34,1°C). The annual average is 10,6°C.
The dominant direction of wind is Southern. The sum of percipitation is higher on the left bank of the Danube, the average is 600-700 mm and it shows the effect of the Dunántúl climatic region.

Mezo- and microclimatic circumstances
Beyond the above mentioned regional climatic characteristics the valley of the Danube has unique microclimate as result of the deep-laying, frequently flooded, mostly wet areas with distinctive vegetation. This microclimate manifests in higher humidity values and creates temperature equalizing effect.

Hidrology

Water regime
The area of management plan belongs to the Middle-Danube but it is not independent from the upper sections of the river. The catchment area of the Upper-Danube has the largest effect on the frequency, endurance and size of the floods on the middle section of the river.
The water supply – and the floods – is affected by the thermal circumstances of the Alpin region beyond the percipitation. Snowmelting and the melting of glacier ice can generate higher flood levels in spring.
As consequence of the catchment area characteristics and climatic circumstances the dinamism is the most important factor of the water regime of the Danube. It means the irregular alternation of high and low water periods and the possibility of flood extant all year long. For example the typical „green flood" of the summers does not develop every year and the level of the flood, its time and endurance is stochastic. This kind of dinamism is the basic character and it provides its variability which is considered very important.

Drift regime
In the discussed section the typical drift form is floating with about 1 mm size as maximum.
On the flood area of the Danube in the natural development process of riverbed, because of the meandering of the main river, breaking over the bends and translocation of the main riverbed side branches and oxbows were created and these fromations were periodically blocked from the water supply. The sediments carried by the floods filled up these parts relatively rapidly.
The productive period of the natural processes is stopped by the physical regulation of the river therefore no more new sidebranches are forming but the upfilling beetween the dikes is still continuous.

Short summary of the different water bodies

Flood area
Over the main riverbed in the Karapancsa section only one side cahnnel can be found, the Mocskos-Duna which was formed by the river regulation works in 1910 on the left side of the river, beetween the 1439,4-1440,5 riverine kilometres. The average width of the Mocskos is 50 metres and its length is 2,1 kms. The upper end is totally upfilled therefore only in case of extremely high water levels is conected to the main river. At the lower end it gets water through a small natural channel.

Areas outside the dikes
The most important watercourses of the Mohács island are the Ferenc canal, the Karapancsa main canal, the Kadia-Ó-Duna, the Új-foki canal moreover the Northern, Western, Southern and Eastern main connecting canals.

Geology

Morphology
The discussed section of the national park is on the Csepel-Mohács plane middle region within the Duna-plane of the Alföld region, exactly the Mohács island landscape subregion.
The whole area is situated on the original flood area level.
Before the river regulating works the surface of the island was reworked and overturned by the river almost completely. The level of the flood area is very distinctive on its Eastern side, the Baracska-Danube (earlier main riverbed later side channel) ruined the banks by its enermous semicircular meanders.

Base rock
The soil forming base layer is alluvial sediment over the whole area. because of the rules of sediment layering the composition and structure of this basal layer is very variable. It can be silty clay, loessy silt, alluvial sand or silty alluvial sand.

Soils
The soil conditions are considerably variable and the soil types can be characterised by alluvial meadow, meadow, marshy and sylvan forming processes. All soil types are similar in that point that the silt of the Danube and the groundwater played keyrole in their development.
The calc content of the sediment determines the reaction of the soils. The slight leaching of the calcareous sediments can not produce acidity therefore the soil reaction is in the sligthly alkaline range.

1.2.2. Biological characteristics

Biogeographical description and ecological processes of the planning area

Earlier the Szigetköz was definitely the most natural flood landscape of Danube in Hungary but after the Slovakian diversion of the Danube resulted enormous damage and this status changed as the area degraded dramatically. With this occurences the only one extending, near natural flood area remained, the so called Lower Danube flood area – and because this the value of the latter increased. The Gemenc-Béda-Karapancsa region forms a very valuable ecological corridor which makes the migration and spreading possible for the flora and fauna elements. In more wider aspect the whole Danube section from the Szigetköz to the lowest part of Karapancsa can be reckoned as an ecological corridor and the probably most valuable part of it is the Lower Danube flood area.
Some of the plant associations of the concerning area can be reserved only by ongoing natural succession processes. For example the purple willow shrubs transforms to black

poplar alluvial forests and the almond-leaved willow shrubs to white willow alluvial forests in few decades. This process is inevitable and therefore the willow shrubberies can only be protected if the possibilities of formation of new stands are ensured. In the same way the black poplar and white willow forests change to white poplar alluvial forests with the silting of the habitat but in a longer period. Consequently the passive protection of the shrubberies and lower standing alluvial forest is needless to force. The best way of protection is to keep the natural processes going on as it will be written later. The protection of these plant associations can be ensured only with the reservation of the continuous succesional steps.
Moreover there are some forest associations which habitats alter very slowly. The black hawthorn shrubs of the middle flood area level and the white poplar forests of the higher flood area are among these with the much drier oak-ash-ulm forests and oak-hornbeam forests of the alluvuial plains. In these habitats the sites does not change in discernible rate therefore retaining of the actual status can be a good way of the protection or if it is necessary to carry out some reconstruction as rolling back invasive species, planting native species, transforming age and spatial structure, etc.

1.2.3. Landscape history of the planning area

Flora and fauna
The flora and fauna of the historical times can be estimated primarily on the base of voyages, maps and hunting memoirs. Before the river regulating works the planning area belonged to the deeper part of the Danube flood area and therefore it was flooded for longer periods frequently. The elevated, bit higher areas were flooded more rarely and only for shorter periods but enjoyed the effects of high gorundwater level and the abundant water supply. In these areas hardwood alluvial forest were formed mostly. At the highest points hornbeam and beech were also existing and in the herb layer many species of the hilly areas. As result of the regulations many of these species vanished.
The fauna, belonging to the wet habitats and extensive primeval forests before regulations, was much abundant in species as it was written in the hunting memoirs of that times.

Land use before the river regulations
Before the human modification of the landscape this flood area was a solid jungle surrounding the side branches, oxbows and periodic water bodies. The river modified the surface frequently washing away places and forming isles at other areas creating the dinamic balance of the habitats.
A few centuries ago the typical land use was a special form of flood area management where the water of the flooding river let flow into the deeper parts of the land through small channels (called in Hungarian „fok” and „fok management”) and was hold out of the river The traditional forms of livelyhood were the fishing, the field management, the freelance livestocks and fruit production. The forest were used only for local fuel, building and tool producing purposes.
Before the building of dikes the flood levels were considerably lower because the water could flow over much more extensive areas. The water take off was a much longer process than today and the water supply of the area was more balanced. On the flood area more water bodies and fields were existing. The forest stands followed the contours of the constant and periodical water bodies moreover smaller patches of trees and gallery forests variegated the fields. On the highest parts of the flooded landscape the species of the surrounding hilly areas were more frequent than today. The number of adventive and introduced species and the abundancy of these species could be insignificant.

Land use after the river regulations
Since the regulating works of the 19th and 20th century the land use changed radically.

Out of the dikes the area of arable lands increased quickly and the management changed in this way. The dried out reeds and shrublands were burned and ploughed and brought into agricultural management.
The majority of forests was felled and the compulsory replantations were carried out as afforestations on the flood area (beetween the dikes) on low yielding fields and plough-lands. In this way the flood area was transformed as wet and water habitats were occupied by extensive forests where area of the plantations was increased.
The forest of the flood area at Béda-Karapancsa was a part of the Habsburg domain.

Traditional flood area management
After the settling with the forming of agriculture on the flood area a characteristic way of management evolved and became determinant: the „fok management". The base activity of this method was fishing. The habitants realized how can they use the natural processes effectively. As the water started to level up at the lowest point, the inhabitants let the water flow out slowly to the plains by overcutting the actual barrier. This formed the „primary fok" and the action calmed the effects of the flood comparatively to the uncontrolled flooding. When the water reached the next high elevation barrier and the water level was still increasing some following openings were made – newer and newer „fok" as the orography made it necessary and possible. The primary overcut was made at the lowest point of the river in the direction of the flow therefore the water flooded the land slowly from under.
With the flood through the opened channels fish could swim out what enriched the stock of the oxbows and ponds. The flooded deep spots served as perfect spawning area and habitat for the fry.
In the falling stage the process was returned. With the water flowing back to the river the fish tried to swim back but in the channels the stake nets were already installed. The larger specimen of fish were taken away and the smaller and younger ones released to the river.
Basic element of this management was the well maintained „fok" and adjoining channels, moreover forming and maintaining of smaller dikes. This work needed many physical work which was carried out by the inhabitants of co-operating settlements. During the times of the turkish wars this water managing system decayed and the channels only at few places became rebuilt.
The water regulations of the 1800s made absolutely impossible the traditional management method of the flood area. The river forced into a narrow bed became faster and it deepened itself and the level of the water decreased. The dikes cut the connection beetween the river and the oxbows moreover on the flood area the deeper level of the main river kept channels from the filling up by water finally. On the outer side of the dikes the floods were off and the remaining water bodies started drying out and silting up. The refreshment of fish stocks disappeared and the habitats became isolated. The fine spawning areas disappeared therefore the river neither got the fry supply. The fish stocks decreased radically and began the decline of the fish fauna too.
The transformation of the water habitats changed the methods and possibilities of fishing.

Fishing
Fishing was one of the main activities in the area. Before the construction of the dikes the settlements bit further from the river could practice this form of management beacuse the water regime ensured the water and fish supply. After the regulating works these settlements changed over for agriculture.
The incomes of fishing exceeded significantly the avereage incomes of the forestry on these fields but the possibilities of the fishing decayed quickly after the regulating and it became insignificant.

Large scale fishing methods:
On the larger water bodies (primarily the river and its side channels) large scale fishing methods were used. The main tool of this type os fishing is a 100-300 metres long and 4-5

metres deep seine. In the winter these fisheries used smaller and specialist tools under the ice but in summer used special nets too.
This type of fishery needed the attuned work of 6 to 8 people therefore they worked in small companies as it's common in industry.

Small scale fishing methods:
The fishing of the shallow, narrow and rushy waters were carried out by „small fishermen" with smaller, not so effective tools. They used most frequently different types of fish-traps as fish weirs and hoop nets in combination with some diverting tool. In the shallow waters they used covering nets and opened baskets called „feeler". On more opened waters the casting and square net were used too.
Following the decrease of the fish stock the number of fishermen also decreased but increased the number of used tools per fisherman. The density of fishing were uneven at the different areas.
After the World War II the rights of fishing was divided by the state and large cooperations got the main rights who give permission for small scale fishermen everywhere. The small fishing is a living tradition nowadays too.

Silviculture
The inner flood area were used mostly for fishing instead of forestry. The forest stands were small and continuously altering. On the permanently changing reefs and aits alluvial softwood forests were grown which were washed away frequently by floods or evolved to hardwood alluvial forest stands.
After the regulation of the river the importancy of silviculture increased particularly, significant area of the flood plain became forested mostly with artificial plantations.

Silviculture of the past
On the Habsburg domain of Béda-Karapancsa the forest planting and renewing coexisted with agriculture and were carried out mostly with oak acorns.
Ont he flood area before the clear felling the sowing was not rare to help the renewal of the stands. As a result of repeated coppicing the hardwood alluvial forest were dominated by the well renewing white poplar and elm at many places.
After the nationalization the forestry was inferior to the hunting and it led to serious changes of the forest structure. The fast groving species like noble poplars and the species not consumed by big game like black nut came to the fore. The concentration of the forest usage resulted homogenous forest stand on large areas and long-continued renewing. The younger stands and the natural renewal suffered from injury of game stock.

Hunting
The flood plain before the river regulations served as very good habitat for the wild fowls. The great proportion of wet and marshy habitats and the large predators (wolves and golden jackal) discouraged the expansion of big game species.
The creation of the dikes, the afforestation and the depopulation of large predators changed the situation basically. The red deer appeared in large numbers and later the wild boar too and the utilization of the big game stock became mainly privilige of the landlords and than of the political elite.

1.2.4. Vegetation
The Danube section of the Duna-Drava National park can be divided in two smaller landscapes:

1. Gemenc flood plain (the Sárköz and its surroundings)
2. Béda flood plain (Mohács island and its surroundings)

Both of them belong to the Alföld (Eupannonicum) flora region and the actual Béda flood plain to the South-Alföld (Titelicum) flora district on base of the scientific literature. But the similarities beetween Béda and Gemenc are so high level maybe the two Danubian flood areas could be treated as one unique and from this viewpoint the Béda shows more

similarities to the Mezőföld and Solt plain (*Colocense*) flora district of Gemenc than to the South-Alföld (*Titelicum*) flora district of Béda and Drava plain.

The subsistence of the Hungarian flood areas are especially endangered nowadays mostly because of antropogenic effects. The recently constructed Slovakian dam above the Szigetköz ravaged the most natural flood area of Hungary and the all Middle-Danube section because its water supply changes. Also in Croatia is planned a hidroelectric power station on the Drava which would have disastrous effects on the Drava river, its flood plain and all of the surrounding ecosystems. If we see the very narrow flood area of the Tisza we can realize that the only remaining wide, extensive and more or less natural flood area in Hungary can be found aside the lower section of the Danube. This makes the Gemenc and Béda-Karapancsa regions very important for nature conservation as the last remarkable area for protection of some rare, important and endangered species and habitat types of the alluvial plains.
The importance of the lower Danubian flood plain is still high contrary to the cultural characteristics of the forests of this area. In the strongly weedy sublayers the native species remained and on the base of this species composition the reconstruction of the original associations is possible with relevant competence.
The flood plain is separated into two different parts by the construction of dikes: the actual flood area beetween the dams and the outer part of the flood plain. The artifical boundary overformed the successional relations. The flood can not flow out so widely as in former times therefore the highest points of the flood area are inundated more frequently. As a result a regressive type of succession began. In this process the oak-ash-elm alluvial hardwood forests (*Scillo vindobonensis-Ulmetum*) formed to white poplar gallery forests (*Senecioni sarracenici-Populetum albae*). On the outer sides of the dikes without flooding water the process is reverse, the softwood alluvial forest stands transformed to hardwood forests and the originally oak-ash-elm hardwood stands became hornbeam-oak (*Carpesio abrotanoidis-Carpinetum*) stands in same cases.
On the Karapancsa section of the flood plain the floodplain area outside the dams is dominant over the actual flood area inside.

1. Purple willow shrubs
Rumici crispi-Salicetum purpureae

The reefs of the Danube are formed mainly by coarse sand. The water supply on these reefs is really extreme as by low water stand the coars alluvium can not hold the water and the soil dries out. On the dry reef ruderal (*Bidention tripartitae* and *Chenopodion fluviatile* groups) and semi-ruderal (*Agropyro-Rumicion crispi* group) herb vegetation forms which later became bushy and transforms into purple willow shrubs (*Rumici crispi-Salicetum purpureae*). The consotiations with *Salix purpurea, Salix alba* and *Populus nigra* can be identified, the formation of the consotiations depends on the actual seed dispersal and water regime conditions. These willow shrub forest stands not so typical as for example the ones in Szigetköz and the possible reason is the sandy alluvium of the lower Danube section wich is not as characteristic as the gravel bed of the Szigetköz.

Characteristic plant species: Different ruderal species (*Amaranthus, Atriplex, Chenopodium species, Agrostis stolonifera, Poa palustris* etc.).

2. Almond-leaved willow shrubs
Polygono hydropiperi-Salicetum triandrae

At spots with lower flow speed – mainly along side branches and in young oxbows – the sediment is fine sand or silty sand. The water supply on these finer alluviums is more balanced as in case of the coarser types so the soils does not dry out even in longer periods of low water stand. At these sites beside the ruderal (*Bidention tripartitae* and *Chenopodion fluviatile* groups) and semi ruderal (*Agropyro-Rumicion crispi* group)

vegetetion the marshy (*Phragmition* and *Magnocaricion* groups) vegetation and the associations of muddy banks (*Nanocyperion* group) get increasing role. The bushy vegetation in this succession row is the almond-leaved willow shrubs in which stands the Salix triandra and the Salix alba can form consotiation. The almond-leaved willow shrubs are pretty sparse, many of the stands are in transforming, silted or degrading phase. The reason of the laters is the lack of water which is a result of the riverbed deepening moreover the poor percipitation and the lower water stands in the majority of last years.

Characteristic plant species: *Chlorocyperus glomeratus, Cyperus fuscus, Galium palustre, Iris pseudacorus, Myosotis palustris, Polygonum hydropiper, Polygonum mite, Rorippa amphibia, Schoenoplectus triqueter* etc.

3. Hungarian hawthorn shrubs
Leucojo aestivi-Crataegetum nigrae

Endemic shrub association of the lower Danube floodplain in Hungary. In the most cases exists beetween the lower standing willow gallery forests and medium level white poplar gallery forests on sloping ground. In the stands of this association more protected species are known like *Carpesium abrotanoides, Crataegus × degenii, Crataegus nigra, Gentiana pneumonanthe, Lathyrus palustris, Leucojum aestivum, Ophioglossum vulgatum, Senecio paludosus, Vitis sylvestris*. Because its rarity probably it is the most important vegetation type of the whole area.

Characteristic plant species: *Carex gracilis, Cornus sanguinea, Crataegus × degenii, Crataegus nigra, Crataegus monogyna, Euphorbia lucida, Euphorbia palustris, Ficaria verna, Iris pseudacorus, Leonurus marrubiastrum, Leucojum aestivum, Lysimachia vulgaris, Lythrum salicaria, Myosoton auqaticum, Phalaroides arundinaceum, Stachys palustris, Symphytum officinale* etc.

4. Black poplar alluvial forests
Carduo crispi-Populetum nigrae

With the partial silting of the coarse sand-gravel reefs the purple willow shrubs (*Rumici crispi-Salicetum purpureae*) transform into black poplar alluvial forests (*Carduo crispi-Populetum nigrae*). This process starts with the upgrowing of the black poplar –normal element of the association and not rarely consotiation forming – which shades and gradually supplants the purple willow. Beside the black poplar the white willow (*Salix alba*) also can form consotiation in such stands where in the earlier phase the shrub vegetation was dominated by the white willow (this phenomenon is characteristic on the reefs of the Drava).
The soil is sandy, loose alluvial. The way of succession – paralell with the white willow alluvial forests (*Leucojo aestivi-Salicetum albae*) goes to the white poplar alluvial forest (*Senecioni sarracenici-Populetum albae*) stage. The black poplar forests are very rare at the lower Danube floodplain, the sites of this type are occupied by hybrid poplar plantations. Smaller black poplar forest stands can be found on the banks of the main river and the biggest side channels.

Characteristic plant species: *Angelica sylvestris, Bromus sterilis, Calystegia sepium, Cucubalus baccifer, Humulus lupulus, Myosoton aquaticum, Typhoides arundinaceum* etc.

5. White willow alluvial forests
Leucojo aestivi-Salicetum albae

The almond-leaved shrubs of the muddy banks and flood area oxbows (*Polygono hydropiperi-Salicetum triandrae*) evolve to white willow alluvial forests (*Leucojo aestivi-Salicetum albae*). The formation is similar to the black poplar alluvial forests (*Carduo crispi-Populetum nigrae*) as the ferquent species of the shrub vegetation, the white willow overgrow and shade the shrub sized willow species (*Salix triandra, Salix viminalis*) than supplant them. The association forms on raw alluvial soils, typically silty and therefore realtively heavy. The typical stands of the white willow alluvial forests are rare at the lower Danube section in Hungary mostly because of the great expanse of forest plantations with different species structure. Moreover there are not many reefs with silty alluvium therefore the almond-leaved whillow shrubs (*Polygono hydropiperi-Salicetum triandrae*) as prefiguration in the successional chain of willow forests are neither frequent. Most of the white willow alluvial forests of this area are untypical and very similar to the subassociation with *Ficaria verna* on lighter soils described from the Szigetköz. The white willow stands – like the black poplar forests (*Carduo crispi-Populetum nigrae*) – evolve into white poplar alluvial forest (*Senecioni sarracenici-Populetum albae*) stands through the further silting of their growing site.

Characteristic plant species: *Caltha palustris, Carex riparia, Galium palustre, Glyceria maxima, Iris pseudacorus, Lysimachia vulgaris, Lythrum salicaria, Myosotis palustris, Polygonum hydropiper, Polygonum mite, Rorippa amphibia, Stachys palustris, Symphytum officinale, Valeriana dioica, Viscum album* etc.

6. White poplar alluvial forests
Senecioni sarracenici-Populetum albae

On the higher sites of the low flood area can be found the white poplar alluvial forests (*Senecioni sarracenici-Populetum albae*). The stands of this association evolves partly from black poplar forests (*Carduo crispi-Populetum nigrae*) and partly from white willow forests(*Leucojo aestivi-Salicetum albae*). This process needs long time. With the upfilling of the production site the growing space of the black poplar and white willow narrowing and it is followed by the forging ahead of the white poplar. Because this association is situated about one meter higher than the two other mentioned, it is flooded much more rarely. The raw alluvial soil of these forests is quite light, sandy and sometimes shows transition to the alluvial forest soil types. The succession goes partly to the direction of alder alluvial forests (*Paridi quadrifoliae-Alnetum*) and partly to the oak-ash-elm alluvial forests (*Scillo vindobonensis-Ulmetum*). The white poplar alluvial forests are different from the consotiation of the latter with white poplar and are really sporadic on the flood area of lower Danube section in Hungary.

Characteristic and rare plant species: *Aegopodium podagraria, Calystegia sepium, Carex remota, Cornus sanguinea, Cucubalus baccifer, Ficaria verna, Gagea lutea, Humulus lupulus, Moehringia trinervia, Myosoton aquaticum, Rumex sanguineus, Typhoides arundinaceum, Viola cyanea* etc.

7. Oak-ash-elm alluvial forests
Scillo vindobonensis-Ulmetum

The evolvement of the white poplar alluvial forests (*Senecioni fluviatilis-Populetum albae*) goes ahead to the mixed riparian hardwood forest (*Scillo vindobonensis-Ulmetum*) stage. The stands of the latest can be found on the high flood plain therefore these are flooded only occasionally with high waters. The soil is alluvial forest soil formed in longer process. These forests can be found on the actual flood area and outside from the dikes too but in the second position the herb layer can be inundated only by upcoming ground water. Some of its beautiest stands exist in Karapancsa.

Characteristic plant species: *Aegopodium podagraria, Anemone nemorosa, Anemone ranunculoides, Arum maculatum, Asarum europaeum, Carex brizoides, Carex remota, Carex sylvatica, Carpesium cernuum, Cerasus avium, Convallaria majalis, Cornus sanguinea, Corydalis cava, Corylus avellana, Dryopteris filix-mas, Euphorbia amygdaloides, Ficaria verna, Fraxinus angustifolia ssp. pannonica, Gagea lutea, Galanthus nivalis, Galium odoratum, Helleborus odorus, Milium effusum, Moehringia trinervia, Parietaria erecta, Paris quadrifolia, Pulmonaria officinalis, Quercus robur, Ribes rubrum, Sanicula europaea, Scutellaria altissima, Tilia tomentosa, Ulmus laevis, Ulmus minor, Veronica montana, Viburnum opulus, Vinca minor, Viola cyanea, Viola sylvestris* etc.

8. Hornbeam-oak forests
Carpesio abrotanoidis-Carpinetum

The hornbeam-oak forests (*Carpesio abrotanoidis-Carpinetum*) evolved at the growing sites of the oak-ash-elm riparian forests (*Scillo vindobonensis-Ulmetum*) with the upfilling of the sites. The soil is brown forest soils which aroses through longer soil formation processes. On the floodplain of the lower Danube section in Hungary the oak-hornbeam association is really rare at the relatively high points. The growing sites are affected by groundwater ensuring humid and mesophilous circumstances. The stands are situated mostly outside from the dikes but occasionally they can be found also on the flood area. The species composition is close to the oak-ash-elm forests but here the higrophylous elements are more rare. In the hornbeam-oak stands the species of hilly and mountainous areas are more frequent than in other associations of the Alföld where these elements are rare. Some submediterranean species can be found also in the stands of hornbeam-oak forests what/that shows the transition to the near flora district of Mecsek (*Sopianicum*).

Characteristic and rare plant species: *Anemone nemorosa, Anemone ranunculoides, Carpesium cernuum, Carpinus betulus, Corydalis cava, Euphorbia amygdaloides, Galanthus nivalis, Galium odoratum, Hedera helix, Helleborus odorus, Milium effusum, Monotropa hypopithys, Pulmonaria officinalis, Ranunculus auricomus, Sanicula europaea, Tilia tomentosa, Vinca minor, Viola sylvestris* etc.

9. Willow swamp forests
Calamagrostio canescentis-Salicetum cinereae

The swamp forests are very rare on the area, only one and tiny stand is known near the state border at Hercegszántó „Szarvastanya”. This stand is almost fully upfilled therefore the species composition is poor. Near the oxbow lakes some stands are in forming stage with important characteristic species of the association as the Salix cinerea and Carex pseudo-cyperus.

10. Non-arboreal vegetation

On the planning area the herbaceous vegetation has minor role mostly because of its small proportion in coverage and because its secondary type in many cases. The natural herbaceous vegetation is limited to the water bodies, to its banks and to the periodic mud surfaces.
In the oxbow lakes and dead channels of the river the succession begins with floating (*Lemnion, Utricularion vulgaris, Hydrocharition* and *Ceratophyllion demersi* groups) and rooted weed vegetation (*Potamion lucentis, Nymphaeion* and *Ranunculion aquatilis* groups). In these aquatic habitats protected species as *Nymphaea alba, Nymphoides peltata, Trapa natans, Marsilea quadrifolia* and *Salvinia natans* live. The weed vegetation is endangered by hobby fishing at many places.

The aquatic vegetation is bordered with marshy vegetation. The most important associations of the *Phragmition communis* group are the *Phragmitetum communis, Glycerietum maximae, Typhaetum latifoliae* and *Typhaetum angustifoliae*. The reed stands with signs of peat forming are very important for nature conservation with typical fen species as the *Urtica kioviensis*. Out of the reed stands the tall sedge communities grow (*Caricetum gracilis, Caricetum ripariae, Caricetum vesicariae*) which cover relatively large areas among the herbaceous wet habitats. One of the important species is the *Carex pseudocyperus* here.

1.2.5. The flora of the planning area

As the planning area is situated far away from the upper, Austrian section of the Danube the demontanous-adventive species are rare here. Therefore the alluvial forests differ clearly from the forests of Szigetköz, only at few locations can be found species with mountanous character (*Aegopodium podagraria, Anemone nemorosa, Anemone ranunculoides, Arum maculatum, Asarum auropaeum, Carex brizoides, Carpinus betulus, Corydalis cava, Dryopteris filix-mas, Gagea lutea, Galanthus nivalis, Galium odoratum, Epipactis helleborine, Euphorbia amygdaloides, Milium effusum, Monotropa hypopithys, Paris quadrifolia, Pulmonaria officinalis, Sanicula europaea, Veronica montana, Vinca minor, Viola sylvestris*).

The ost famous plant of the area is the endemic Hungarian hawthorn (*Crataegus nigra*) and its hybrid with the *Crataegus monogyna*, the *Crataegus × degenii*.

The existence of some submediterranean species is characteristic too, like the *Carex strigosa, Carpesium abrotanoides, Helleborus odorus, Lonicera caprifolium, Primula vulgaris, Scutellaria altissima, Tamus communis, Tilia tomentosa, Vitis sylvestris*. The occurence of these species can be explained with the neighbourhood of the Southern-Transdanube flora district (*Praeillyricum*)

In the region there are other important, rare or protected species too which colour the flora, like the *Blackstonia acuminata, Cephalanthera longifolia, Cephalanthera damasonium, Dactylorhiza incarnata, Dryopteris carthusiana, Dryopteris dilatata, Epipactis palustirs, Equisetum hiemale, Equisetum variegatum, Fritillaria meleagris, Gentiana pneumonanthe, Hippuris vulgaris, Leucojum aestivum, Listera ovata, Marsilea quadrifolia, Neottia nidus-avis, Nymphaea alba, Nymphoides peltata, Orchis purpurea, Orchis militaris, Platanthera bifolia, Ribes uva-crispa, Ribes rubrum, Salvinia natans, Scilla vindobonensis, Trapa natans, Urtica kioviensis*.

In the Karapancsa section of the Duna-Drava National Park until this time 24 protected species are described. It is not as much as in the Drava region but if we mention the more homogenous character of the Danube region than the Drava plain and the border position beetween three flora districts of the latter, this relatively lower richness still reaches a good level. Maybe one of the reasons for the smaller degree of species richness is the less research carried out in this region. The thematic researches are going on only in the last 10-15 years and many of the valuable data originate from this time as the newer data of Cephalanthera longifolia, Epipactis microphylla, Ranunculus lingua, Urtica kioviensis in the lower Danube plain of Hungary. The compleat discovery of the marshes, fens and other fragmental habitats can serve many more important vegetational data and some new rare or protected plant species for the landscape.

The most important protected species of the Karapancsa section are the following:
1. *Crataegus nigra* – Hungarian hawthorn
The distribution range of this endemic species extends from the Csepel island to the Lower-danube and in this relation this is the most important plant species of the lower Danube plain. It can be found in many dispersed locations. Its primary growing site is the transitional slope beetween the lower and higher flood area where it forms natural forest

border or own bush vegetation. It can be found as solitary plant in the white poplar alluvial forest stands (Senecioni sarracenici-Populetum albae), oak-ash-elm forests(Scillo vindobonensis-Ulmetum) and hornbeam-oak forests (Carpesio abrotanoidis-Carpinetum) too. Its populations are not endangered directly but the silviculture has effects on it of course.

2. *Crataegus* × *degenii* – Dégen hawthorn
The hybrid of the Hungarian (Crataegus nigra) and common hawthorn (Crataegus monogyna). Fairly rare but can occur at new sites. The growing site is similra to the Hungarian hawthorn.

3. *Fritillaria meleagris* – Checkered lily
It is one of the most beautiful and most rare species of the lower Danube floodplain of Hungary. It is existing with one and lonely population on the outer side of the dike near Homorúd mainly in black nut plantation on white poplar (Senecio sarracenici-Populetum albae) and oak-ash-elm (Scillo vindobonensis-Ulmetum)growing site. It is endangered by collecting because of its beauty therefore needs extra protection through education and protection of the growing site. In this spot the finishing of silviculture and the changing of the wood stock for native species (Fraxinus angustifolia ssp. pannonica, Populus alba, Quercus robur, Ulmus laevis, Ulmus minor).

4. *Leucojum aestivum* – Spring snowflake
This protected species is relatively frequent and typical in the white willow alluvial forests (Leucojo aestivi-Salicetum albae). It is also existing in white poplar (Senecioni sarracenici-Populetum albae) and oak-ash-elm (Scillo vindobonensis-Ulmetum) forests. Because its abundancy extra protecting actions not needed.

5. *Nymphoides peltata* – Fringed water-lily
This species lives in the dead arms and oxbows in the lower Danube flood plain in the rooted weed vegetation of the water bodies. It is known only at few locations near Hercegszántó. For the protection the ensuring of the ideal water level and the control of human activities (like fishing) is necessary. The species is also endangered by invasion of some aquatic species like the Azolla caroliniana.

6. *Vitis sylvestris* – Wild grape
The wild grape is a sporadic species of the oak-ash-elm (Scillo vindobonensis-Ulmetum) and hornbeam-oak (Carpesio abrotanoidis-Carpinetum) forests of the Danube floodplain in Hungary. In the silviculture the liana species (like vine, ivy and clematis) are frequently eliminated and it causes the rarity of the Vitis sylvestris. For the protection of the species changing this fashion is very important.

1.2.6. Fauna

Invertebrates
To evaluate the invertebrate fauna of the area is not an easy task because of the sporadic data of the species groups. Fortunately the Béda-Karapancsa landscape is relatively well discovered in this meaning.
The row of importance is based on existence frequency. In this landscape 7 new species were recorded for Hungary and many new for the Alföld region which are classified as rare or endangered. The almost 3000 species rich fauna can evaluate only together with the flora but this type of research unfortunately is not known from this area. From the data of researches it seems clearly that the most important habitats are the natural like forest stands, especially the older oak-ash-elm stands and the white willow stands near water bodies. The less species rich areas are the artificial plantations (hybrid poplar and black

nut stands). The more rare habitat types - like the different grassy areas and non arboreal marshes - incerase not only the habitat diversity but are very important because of their species richness too.
The faunal description of the lower Danube flood valley of Hungary is still in beginning stage. The survey of the invertebrate fauna need continuous data collection especially with the involvement of species groups useable in monitoring. This sepcies groups are the crustaceans (Crustacea), dragon and damsel flies (Odonata), beetles (Coleoptera) and caddis flies (Trichoptera). The research of aquatic insects would be also useful what can be matched easily with the tasks of the National Biodiversity Monitoring System.

Spiders
Faunal data collection for spider was carried out only one time in Béda-Karapancsa in 1990-91. This research showed 105 species with two new ones for the Hungarian fauna, the Porrhomma montanum and Phintella castriesiana.
The hardwodd alluvial forests hold 82 species and 40 of these only exist in this habitat type.

Coleopters
The planning area is barely researched for the Coleoptera. The earlier reserches detected only few hundred species (while in Hungary the total amount of beetle species is around 13000). Among the specialists the possibilty of finding many other species is accepted among them with rare ones for all Hungary.

Population characteristics of some important species

species	Population
Calosoma sycophanta	depends on caterpillar density of gipsy-moth
Carabus coriaceus	strong (Horvatovich 1992)
Oeceoptoma thoracium	strong
Librodor quadriguttatus	strong
Ludius ferrugineus	weak
Lucanus cervus	strong
Dorcus parallelepipedus	strong
Cetonia aurata	strong
Liocola lugubris	strong
Potosia aeruginosa	strong
Potosia cuprea	strong
Potosia fieberi	strong
Stenocorus meridianus ab. cantharinus	mediocre
Acmaeops collaris	strong (Hegyessy and Kovács 2003)
Grammoptera ruficornis	strong (Hegyessy and Kovács 2003)
Strangalia quadrifasciata	mediocre
Cerambyx cerdo	strong
Cerambyx scopolii	strong
Obrium cantharinum	weak
Aromia moschata	strong
Phymatodes testaceus	mediocre (Hegyessy and Kovács 2003)
Xylotrechus pantherinus	weak
Xylotrechus rusticus	strong (Hegyessy and Kovács 2003)
Clytus arietis	strong (Hegyessy and Kovács 2003)
Plagionotus detritus	strong

	(Hegyessy and Kovács 2003)
Chlorophorus figuratus	mediocre (Hegyessy and Kovács 2003)
Agapanthia villosoviridescens	strong (Hegyessy and Kovács 2003)
Agapanthia cardui	strong (Hegyessy and Kovács 2003)
Tetrops praeusta	weak (Hegyessy and Kovács 2003)

Note:
The species written with ***bold italic*** letters are protected, and the species written with *italic* letters are interesting elements of the fauna.
The nomenclature follows the works of Endrődi 1956, Kaszab 1971, Medvegy 1984 and Móczár 1969.

Lepidopters
The researches of the year 1992 detected 408 larger species of Lepidoptera, among them 9 protected species. Since that time this number increased a bit as a result of amateur researches. Regardless of these data the area can be treated as barely researched in the scope of lepidopterology.
If we try to make a ranking list the Apatura iris is the most important species admittedly.

Fish fauna
There is no complete scientific publication about the fish fauna of the lower Danube valley in Hungary, only sporadic faunal data can be found in the scientific literature (BERINKEY 1972, KALOCSA és SCHMIDT 1996, GUTI 1997, GYÖRE 2003, DEME 2003).

Aquatic habitats of the planning area
The expanding flood plain of the lower Danube valley was characterised by large variability and complex pattern of aquatic habitats in the past.
On base of geomorphological, hidrological and ecological principles the characteristic aquatic habitats – the so called potamic biotops – are divided into four main classes which has different type connections with the living main channel. These are the eupotamic, parapotamic, plesiopotamic and paleopotamic biotop. (see the graphic and table below)

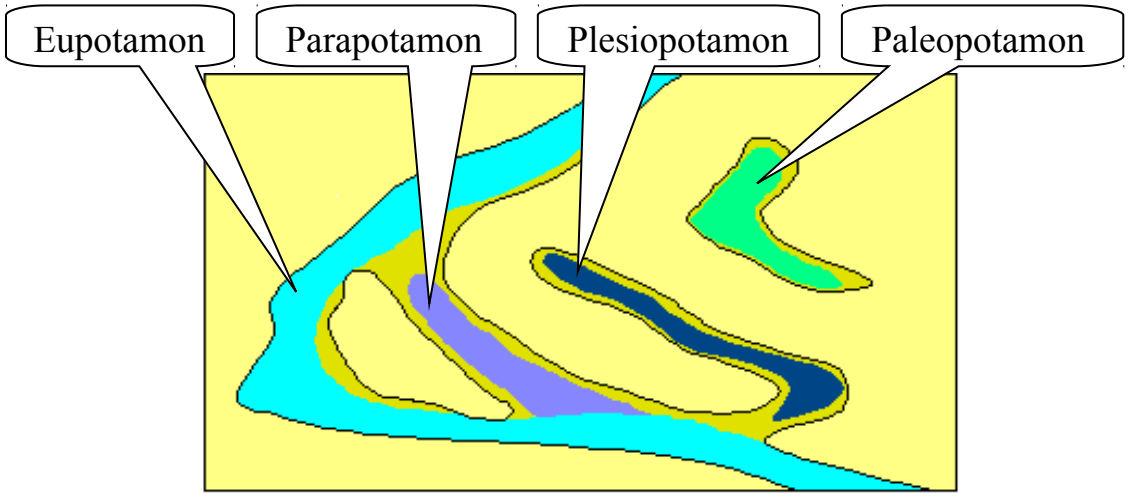


Figure 1. Schematic diagram of the geomorphological character of thepotamic biotops

Characteristics of the aquatic biotops

Biotop	Eupotamic	Parapotamic	Plesiopotamic	Paleopotamic
Flow	permanent	periodical	periodical	not characteristic
Isolation	not characteristic	not characteristic	periodical	permanent (enduring)
Bed	coarse gravel, stone	gravel, sand, silt	sand, silt, clay	silt, clay
Floating drift amount	large	variable	moderate	small
Temperatrure layering	not characteristic	periodical	characteristic	characteristic
Vertical layering of oxygene	not characteristic	periodical	characteristic	characteristic
Conductivity of water	moderate	mediocre	high	high
Phytoplancton biomass	little	considerable	considerable, variable	little
Macrovegetation	not characteristic	poor	abundant	very abundant
Zooplancton biomass	little	considerable	very considerable	little
Zoobentos biomass	little	considerable	considerable	little
Fishfauna species number	high	high	mediocre	moderate
Character of fish stock	reophylous	reophilous, neutrophylous	neutrophylous, limnophylous	limnophylous
Fish ctock biomass	little	variable	extremly variable	considerable

One of the main characteristics of the potamic biotops is that they are outlined by theriparian region of the riverbed of small or medium water levels – consequently they are extending for the all riverbed profile.
The fish stock of the river is characterised by a lateral partial differentiation namely it is connected to the potamic biotops.

Eupotamic biotop (practically the living arms of the river Danube)
The species which can be detected regularly are the sterlet (*Acipenser ruthenus*), roach (*Rutilus rutilus*), chub (*Leuciscus cephalus*), ide (*L. idus*), aps (*Aspius aspius*), minnow (*Alburnus alburnus*), bream (*Abramis brama*), blue bream (*A. ballerus*), nase (*Chondrostoma nasus*), barbel (*Barbus barbus*), white-finned gudgeon (*Gobio albipinnatus*), stone moroko (*Pseudorasbora parva*), prussian carp (*Carassius auratus*), carp (*Cyprinus carpio*), catfish (*Silurus glanis*), eel (*Anguilla anguilla*), burbot (*Lota lota*), perch (*Perca fluviatilis*), pikeperch (*Stizostedion lucioperca*), monkey goby (*Neogobius fluviatilis*), Kessler's goby (*N. kessleri*), tubenosed goby (*Proterorhinus marmoratus*).
Among the 45 detected species of the eupotamic fishfauna from the last 25 years are 2 disappearing species, 6 endangered, 15 rare and 14 common in the Hungarian fish fauna, moreover 1 immigrant and 7 alien species exist for the Carpathian basin. The number of species which can be considered as endemic in the catchment area of the Danube is 3.

Parapotamic biotop (the living side channels of the Danube)
On the parapotamic habitats of the Danube 44 species of fish were detected in the last 25 years. It is possible to find the belica (*Leucaspius delineatus*) beacuse it was registered on the upper part of the river at Paks in 1979 (KERESZTESSY 1986).

The largemout bass is present (*Micropterus salmoides*) as it shown by indirect data, the commercial fisheries catch in the neighbouring sections 30-40 individulas in yearly average.
The typical elements of the fishfauna on the planniing area are the pike (*Esox lucius*), roach (*Rutilus rutilus*), chub (*Leuciscus cephalus*), ide (*L. idus*), minnow (*Alburnus alburnus*), bream (*Abramis brama*), blue bream (*A. ballerus*), white bream (*Blicca bjoerkna*), bitterling (*Rhodeus sericeus*), stone moroko (*Pseudorasbora parva*), prussian carp (*Carassius auratus*), carp (*Cyprinus carpio*), catfish (*Silurus glanis*), eel (*Anguilla anguilla*), pumpkinseed (*Lepomis gibbosus*), perch (*Perca fluviatilis*), ruff (*Gymnocephalus cernuus*), pikeperch (*Stizostedion lucioperca*), volga pikeperch (*S. volgensis*), tubenosed goby (*Proterorhinus marmoratus*).
From the 44 species of the parapotamic fauna 4 species are endangered, 15 rare and 15 common in the Carpathian basin, moreover 1 is immigrant and 9 is alien. The number of species which can be considered as endemic in the catchment area of the Danube is 2.

Plesiopotamic biotop (oxbows, connected by system of channels and canals)
Typical species of the plesiopotamic fishfauna are the pike (*Esox lucius*), roach (*Rutilus rutilus*), rudd (*Scardinius erythrophthalmus*), tench (*Tinca tinca*), bitterling (*Rhodeus sericeus*), stone moroko (*Pseudorasbora parva*), crucian (*Carassius carassius*), prussian carp (*C. auratus*), carp (*Cyprinus carpio*), weatherfish (*Misgurnus fossilis*), pumpkinseed (*Lepomis gibbosus*), perch (*Perca fluviatilis*), ruff (*Gymnocephalus cernuus*).
8 species are rare and 14 are common in Hungary among the known species of the pleisopotamic water bodies of the area, moreover 3 species are alien in the Carpathian basin.

Amphibians
From the species of the Hungarian amphibian fauna the following are registered at the planning area

Common name	**Scientific name**	**Note**
common newt	*Triturus vulgaris*	smaller ponds
danube crested newt	*Triturus dobrogicus*	smaller ponds
edible frog	*Rana esculenta*	very common
pool frog	*Rana lessoanae*	common
marsh frog	*Rana ridibunda*	very common
moor frog	*Rana arvalis*	sporadic
agile frog	*Rana dalmatina*	common
fire-bellied toad	*Bombina bombina*	very common
common spadefoot	*Pelobates fuscus*	common at some locations
green toad	*Bufo viridis*	common at some locations
common toad	*Bufo bufo*	very common
European tree frog	*Hyla arborea*	very common

Reptiles

From the 15 species of the Hungarian reptiles fauna the following 8 are registered at the planning area

Common name	**Scientific name**	**Note**
grass snake	*Natrix natrix*	common
dice snake	*Natrix tesselata*	common
aesculapian snake	*Elaphe longissima*	common

smooth snake	*Coronella austriaca*	very rare
European pond turtle	*Emys orbicularis*	common at some locations
sand lizard	*Lacerta agilis*	common
European green lizard	*Lacerta viridis*	rare
slow worm	*Anguis fragilis*	rare

Birds

The most important species of birds are the following:

Black stork (*Ciconia nigra*)
Nowadays the 2/3 of the overall stock of black torch is endangered by any circumstances. The basic and most typical endangering effects are the activities of silviculture. The continuous transformation of the forests serving as natural habitat for the species, the planting of alien species worsen the conditions of nesting. The disturtbing effects of silviculture affect the results of nesting considerably because of the shyness of the species.
Another endangering factor is the decreasing area of the wet habitats which serve as feeding gorunds. The fall of the ground water level because of the riverbed deepening and the upfilling of the wet habitats on the flood area keep narrowing the watery places dramatically.
The species can be evaluated as an indicator species of wet habitats in the lower Danube valley because its nesting and feeding are connected to the habitats of the flood area.
On the Karapancsa section of the Duna-Drava National Park the population is 6 nesting pairs which is signed as stable by the continuous monitoring.

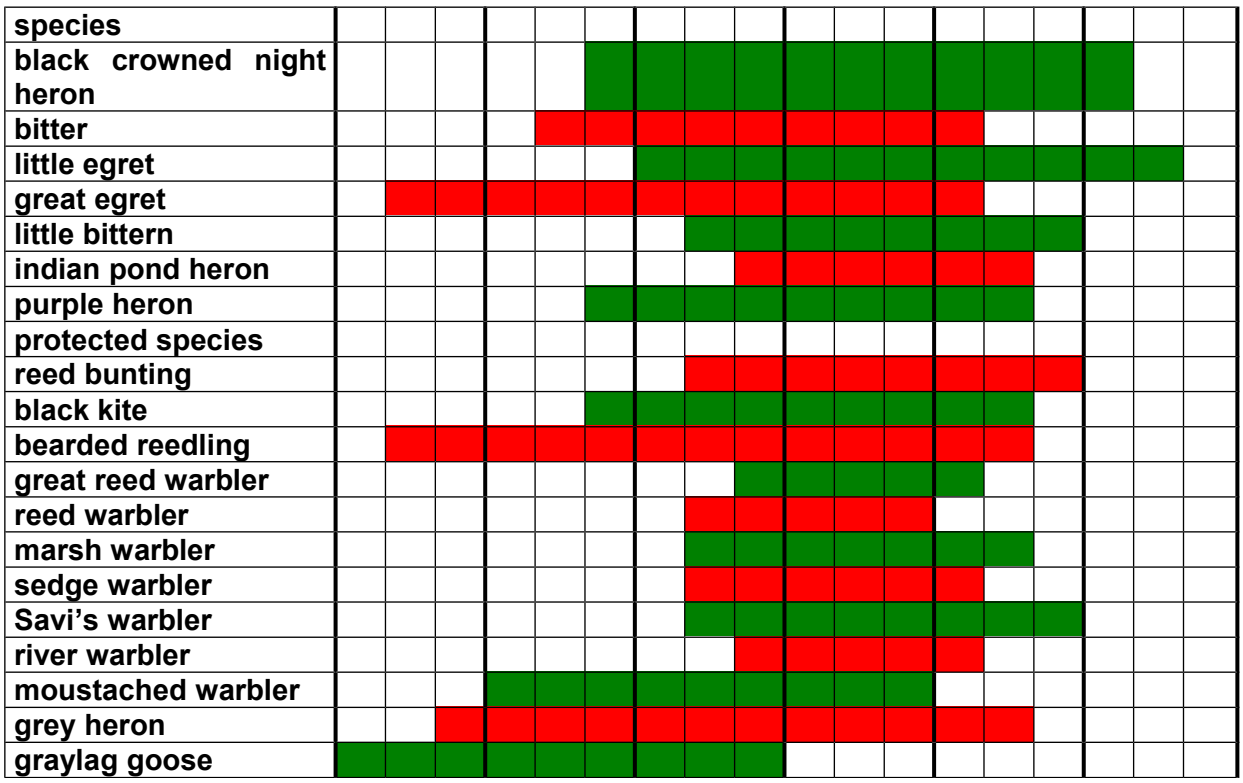
White tailed eagle (**Haliaeetus albicilla**)
The floodplain of the lower Danube section is one of the main habitats of white tailed eagle in Hungary. The feeding grounds are the wet habitats primarily but the birds search food in the nearby fish lakes and in the living channels of the river.
The most important endangering factors are the forerstry activities.
On the planning area the population is formed by 4 nesting pairs steadily. The overwintering nesting population in the winters is nearly doubled by migrating birds which overwinter here.

Black kite (*Milvus migrans*)
In Hungary the main nesting populations of the species live alongside the Danube and Tisza. The birds are tied to the alluvial forests and wet habitats as their livnig and nesting sites.
At the Karapancsa section of the national park the black kite is relatively rare, only one nest is known in this area but this is continuously inhabited.

Colony nesting birds
Sand martin (*Riparia riparia*)
In the Béda-karapncsa region there is one colony of the species on the Béda side but the birds use the Karapancsa also as feeding ground. The results of nesting depend on the water level of the Danube strongly, in some years the nesting can fail.

The following chart shows the nesting periods of the most important and characteristic sepcies of reed and sedge-reed habitats.

	march			**april**			**may**			**june**			**july**			**august**		
strictly protected																		



Considerable migrating wading bird species

The flood area of the Danube ensures resting and feeding area through the migrating seasons. In this time numerous groups of different species abide near the shallow oxbows, ponds, wallows. On the base of observations of the last few years the most considerable species and their typical goup sizes at the main feeding spots are the following:

great egret: 150 specimen
little egret: 120 specimen
common spoonbill: 20-50 specimen
black stork: 40-70 specimen
white stork: 10-15 specimen
grey heron: 150-180 specimen

Considerable wintering species

The migrating bird groups in winter which come form Northern Europe find encouraging circumstances for overwintering along the Danube. Some species (divers, loons) stay on the not frozen inner wterbodies and only after the long continued freezing of the waters appear on the living Danube. In winter at some places the size of the goose groups can reach the several thousand or more ten thousand specimen. These birds go to feed to the surrounding agricultural lands. The mixed groups of ducks can also grow to hundreds and sometimes to thousands.

The most important wintering species:

Greater white-fronted goose, bean goose, greylag goose groups, rarely red-breasted goose.

Bufflehead, common pochard, teal, common mallard, tufted duck, sometimes northern pintail, northern shoveler, gadwall, red-chrested pochard, velvet scoter.

Great crested grebe, little grebe, sometimes black-necked grebe, rarely horned grebe.

Eurasian goosander, smew, mute swan. mixed groups of gulls, cormoran.

Cavity nesting birds

The tree cavities has enermously important role in the forest ecosystems therefore their protection is an absolute priority. The most endangering activity for any forest ecosystem is the non appropriate forest management. The used methods concentrate on the economical aspects in our times too and in this approach is no place for the old, dried, decaying tree specimens because they are accounted as the hosts of the pests moreover has no economical value. The elimination of these trees cause the disappearing of the species for which the well protected and special tree cavities are necessity. Beside the cavity nesting birds the trees ensure living area and security for example to many species of bats.

Mammals

The following mammal groups and species has to be accentuated from the mammal fauna of the planning area:

Bats
The potentially existing bat species can be divided into two groups by their daylight and breeding homes.

I. group: species living and feeding on the flood area permanently, breed in tree cavities
Barbastelle (*Barbastella barbastellus*), Daubenton's bat (*Myotis daubentoni*), pond myotis (*Myotis dasycneme*), Natterer's bat (*Myotis nattererri*), common pipistrelle (*Pipistrellus pipistrellus*), Nathusius' pipistrelle (*Pipistrellus nathusii*), common noctule (*Nyctalus noctula*), Leisler's bat (*Nyctalus leisleri*).

II. group: species living and breeding in the buildings of the surrounding settlements, feeding on the flood plain
Greater mouse-eared bat (*Myotis myotis*), lesser mouse-eared bat (*Myotis blythi*), serotine bat (*Eptesicus serotinus*), grey long-eared bat (*Plecotus austriacus*), parti-coloured bat (*Vespertilio murinus*).
Some species of the upper group - pond myotis, common pipistrelle, common noctule, Daubenton's bat – which can live in the buildings of the flood area can be put into this group too.

Habitat requirements of the bats
The habitat requirements of the different bat species are so similar in general that it is not needed to discuss them one by one. Of course some species prefer some certain conditions but the other circumstances have effect on their life too. If the followings are fulfilled the bats generally represent themselves with many species and numerous populations:
Old or middle aged, preferably mixed forest stands on the area. The cavities of the older specimen ensure the perfect daylight hiding place for the breeding and overwintering animals also.
Diversified and abundant insect fauna. The bats can find food in acceptable quantity and quality.
Good water supply. The wet areas serve as drinking and feeding area for the bats.
Enough cavities. The bats if were disturbed can change their resting and breeding cavity.

Otter - *Lutra lutra*
The otter is fairly frequent on the area, both at the waters of fisheries and not fished water bodies. The stock is not endangered on the protected area but it is necessary to continue its monitoring.

Wild cat – *Felis silvestris*

The species lives in the less disturbed, old forests stands but can be seen on the border area of forests and grasslands, reed stands too. The most endangering factor for the species is the cross breeding with domestic cats which results genetic erosion.

European beaver - *Castor fiber*
The European beaver disappeared from Hungary in the middle of the 19th Century. The reintroduction of the species has begun in the autumn of 1996 near the planning area, in Gemenc and later in 2004 it continued. After releasing 50 specimen on the area of the national park along the Danube beavers exist nowadays. At some places the location was unsuccesful and maybe it is too early to give final results but on the base of different experiences it can be said the species will part of the fauna with high level of probability.

Big game species

Red deer – *Cervus elaphus*
The lower area of Danube flood plain is probably the most famous habitat of red deer in Hungary and in the population can be found specimen with eminent trophy. Therefore the importance of the species is very high for the hunting. This is the base of the conflict with the nature conservation beacuse the numerous red deer population has strong negative effects on the naturalness of the habitats.

Roe deer – *Capreolus capreolustat*
With its smaller body and less frequent population the species has effects on the habitats of course but not as high as the red deer. The roe deer prefers the more opened habitats therefore the population is not as strong in the mostly forested area as the one of the red deer.

Wild boar – *Sus scrofa*
The wild boar population is very strong on the area and it has enermous effects. The species seems to be invasive and it prefers the wet habitats where disturbs the lower layers of vegetation very strongly. At the habitats, where groups live, the degradation is conspicious. The species has great role in hunting but the problem is the reproductiveness of the species not the different interests of nature conservation and hunting.

1.3. The nature conservational management of Karapancsa

Silviculture
As most of the planning area is forested and is under economic management, among all of the management activities the forestry is the most important. Unfortunately the forest stands are absolutely artificial plantations on large areas with non native species or not accordant to the actual habitats and with degraded, impoverished underlayers. Therefore the proper way of management and methods are very important for the nature conservation of the Karapancsa region.
As it is written in the law of forestry according to protected areas, the artificial plantations of alien and cultural variants of species has to be changed for mixed forests of properly choosen native species of the actual habitats. Because of the large proportion of the plantations this action can be carried out only in medium or longer terms.
In the economically managed stands of native species and habitat-similar stands, the aim is to lengthen the turning period of fellings and renewals because it can ensure the survival of the most species. It's really important to keep the oldest tree specimen standing and leave dead trees and wood in every forest section because it gives habitat for many important species.
In all forest stands the beating back of invasive species – not only arboreal – is a priority.
The near natural and natural forest stands have to be kept as they are and let the natural processes working. The management can aim only the conservation. Felliing native

species is only permissible in case of serious disaster or to avoid danger of life. The protection against the invasive herbal and arboreal species is a priority.
Throughout any silvicultural work the use of machines has to be minimzed as it is possible especially the use of large vehicles.

Water management
In Karapancsa the typical water bodies are the main channel of the Danube and the network of canals partly originated from older branches of the river and partly artificially constructed. Because of the lowering of the main riverbed of the Danube the water supply of the area is defective and this problem is enforced by the extreme water regimes of the last decades. The latter means lower water levels for longer periods and inserted really high floods.
To reduce the effects of the above mentioned processes it is needed to supplement the missing water in the side channels and in the canal system. Therefore building of some newer constructive works can be adoptable to hold or drive the water in the smaller waterways. In the main channel of the river further deepening of the riverbed is unacceptable in any ways moreover the leveling of the average water level would be meritable.

Fishing
The fish stock of the area shows decrease compared to the earlier times. It is mainly caused by the decay of the breeding sites. The other principal reason is the overuse of the stocks which has two ways: the economical fishing and the hobby fishing. In the planning area – which is a protected site in Hungarian, European and World level too – the economical fishing is not sufferable in longer terms. To achieve this the best solution would be to ensure it in the laws related to fishing or by acquiring the management rigths for the nature conservational managing body (the Duna-Drava National Park Directorate)
Hobby fishing also have a devastating effect on the fish stock and it has cultural reasons. In the earlier times fishing in the backwaters was free for the habitants and they practised it frequently. Nowadays the water bodies are decayed in size and number and as a result of the missing of the breeding sites the renewal of the fish stocks suffer. Beside the written circumstances many of the local and visting fishermen feel the right – opposite tow the concerning rules - to catch and hold as many fish as they can what bears significant influence on the fish stock.

Hunting
The big game stock of the area is relatively abundant and connected to the very famous Gemenc area which gives special importance in hunting to the area. The red deer stock of the lower Danube floodplain in Hungary is worldwide famous which results not only strong hunting activity but higher demand for a numerous population of this game species. The other hunted big game of the area is the wild boar which has also a strong population here. The hunting of these big games goes on normal level which is not enough for the natural habitat types. Because the lack of the great carnivores the only controlling factor for big games is the hunting and it is not frequent enough to protect the habitats effectively.
The water fowl hunting of the area is limited – only done in short periods – but has obvious effects.
As it was mentioned earlier in case of fishing, the best solution would be the hunting management carried out by the national park directorate. This role has special demands maybe difficult to solve for the nature conservational organization.
In general the decrease of big game populations and stopping of water fowl hunting needed to reach the conservational aims.

Agriculture
The plough management as the most caracteristic way of agriculture is not extensive in the planning aree mostly because the plough lands typically are not covered by the

National Park. The protected plough lands can be normal ones or special areas of big game feeding, latter managed by the hunting companies.
The grasslands of the area are situated mainly on the dikes. In these grass stripes the grazing of sheep herds is typical if live stock is given in the neighbouring settlements, other cases the haymaking is carried out by the water management body not as economical activity but as cleaning of the area for the benefit of flood defence. The other plain grasslands are typical haymaking plots.
The mowing times can be fitted easily to the requirements of the nature conservation and on the other hand this activity is effective as protection against reforesting and plant invasions therefore very important.

Tourism
The Karapancsa area is relatively neglected from the viewpoint of tourism. The reason is its distance from the bigger cities and limited possibilities of transport. Otherwise the area is not famous from many viewpoint therefore the interest is limited too. For the nature conservation it is not a real problem because it helps to protect the rare natural and important sites and much easier to control the visiting in well organized centers of tourism which are given at other points of the National Park.

Research and education
Despite of its portected status Karapancsa is a less researched area. The sporadic faunal and vegetational datat focus on the protected species, mainly as result of the daily routine of National Park rangers. Some specialist researches also was carried out by different scientists of different disciplines.
Becuse of its distance from bigger settlements – where schools and other institutes are situated – the educational use is relatively limited.
To cover the fauna and flora researches important for nature conservation the incitation of base studies is necessary what can be solved in form of field studies of specialist schools.

2. MANAGEMENT PLAN FOR “KARAPANDŽA“

2.1. Basic information

Protected area name	Gornje Podunavlje
Protected area category	Special Nature Preserve
Protected area since	2001
Surface area	19,605.00 ha
Planned period under Management Plan	2011 – 2020
Controller	PC “Vojvodinašume“ Preradovićeva 2 21 131 Petrovaradin Lumber camp “Sombor“ Sombor Apatinski put 11 25 000 Sombor
Documentation management basis	Regulation on protection of SNPGP Management Plan Management Program Rulebook on guard service and the internal order Compensations for the use of the Protected area

International status of the Special Nature Preserve "Gornje Podunavlje" and Karapandža

According to the classification of the International Union for the Conservation of Nature (IUCN) Gornje Podunavlje, of which Karapandža is an integral part of, falls into category IV - Habitat and species management area. Gornje Podunavlje is on the list of Ramsar areas, filed under 1737 (added to Ramsar list 20.11.2007).

SNP "Gornje Podunavlje" is on the national list of Preserve proposals of the "Mura-Drava-Danube" biosphere.

Essential values and characteristics of the Karapandža as a part of the Gornje Podunavlje are:

Authenticity – Karapandža is characterized by traits that give it special natural value.

Genuineness - geomorphologic characteristics can be practically considered autochthonous. Natural characteristics of this area have been shaped by water of the strong river network for centuries. Due to flooding of the Danube large areas of the region have been at times turned into large swamps and lakes. Several centuries ago, the whole territory was "wild" and impassable. In time, the largest part of these areas has been turned into arable land by hydro-ameliorative works, so the Karapandža of today represents the last remnant of the primordial Pannonian nature.

Representativeness - foundational phenomenon of the Karapandža, in addition to the beauty of the scenery/landscape is the degree of preservation and diversity of native orographic and hydrographic types of marshlands (islands, fluvial islands, bayous, ponds and swamps), preservation and verdure of native marshland plant life (marsh forests , meadows, reed-patches etc.), diversity and richness of the flora as well as the presence of rare and semi-rare types of plants, diversity and richness of the fauna;

Rarity - Karapandža is a marsh region which represents a remnant of one time verdant and almost impassable marshlands;

Diversity - this area represents a specific region, which is biogeographically, vegetatively, concerning its flora and fauna, in whole and by its differing parts different from other regions of our country. This natural asset is a mosaic of ecosystems that are interconnected into a single whole, so that this single whole, as well as every ecosystem individually have a special significance in scientific, educational, economic and sport-recreational aspect.

Wholeness – integration level of the ecosystems in the region of the natural asset can be primarily seen in functional connectedness of water and land environments. Mutual connections and relationships between individual ecosystems of this area arise from their characteristics.

Landscape values - mosaic shifting of water and land based ecosystems has a great aesthetic value. In this diverse, rich and abundant natural occurrences and forms, in their mutual connectedness in harmonious entanglement, a primordial beauty of nature that ennobles the human spirit has been preserved.

Tourism values - due to its location near the city of Sombor and surrounding villages Bački Breg, Kolut and Bezdan, Karapandža is well connected by lines of communication and it is easily accessible. With its natural features, its beauty, opportunities for hunting, fishing and other water based activities, as well as exploration of nature, year after year it is becoming more and more attractive as a resort area.

It represents a part of Gornje Podunavlje that has been registered as an Important Bird Area (IBA), Important Plant Area (IPA) and Prime Butterfly Area (PBA).

2.2. Natural resources of the Karapandža

2.2.1. Geomorphological, geological and hydrological characteristics

Location of the Gornje Podunavlje has been determined by following geographic coordinates:

a) centre coordinates

45°44"51" N 18° 56° 53" E

b) dimensional coordinates

45°55"16" N - 45°31"47" N
18°49"08" E - 19°05"43" E

True altitude of Karapandža is
Minimum: 80 m above MSL
Maximum: 88 m above MSL

Based on the widespread sediment, according to Marković and Marjanović (1966) the following have been singled out:
- Upper terrace of the Danube
- Lower terrace of the Danube
- The Danube alluvial plain

Upper fluvial terrace of the Danube, true altitude of 80m to 88 m, consists of layered sand in the slope, which is covered with quicksand dunes, pond and land loess.
Lower fluvial terrace of the Danube, true altitude of 80m to 84 m, consists from layered sand and mud of the Danube, as well as from sand loess.
Alluvial plain of the Danube, is 6 to 26 km wide, and consists from recent sediment of sand, gravel and mud.

2.2.2 Climate characteristics

Karapandža climate is caused by a large number of factors, the most significant being the geographic location, air currents, and local conditions such as geomorphological characteristics, vegetation etc.
Mean monthly air temperature is lowest in January (-0.9°C), while it is the highest in summer, in July (20.9°C).
Winds are one of the most important climate factors. On average, there are only 15 per mille of calm winds. The most frequent winds come from the North-West 148 per mille and North - northern wind 114 per mille. Next in frequency, is South-eastern wind - Košava 114 per mille.
Distribution of precipitation through the seasons is special significance for plant and animal life, especially in the vegetative period. During the summer, the highest amount of precipitate is excreted, up to 171 mm or 30.5 % of the total amount. Spring comes in second with 149 mm or 26.5%, while Autumn has 126 mm or 22.4 %, during winter the lowest amount is excreted, total of 111 mm or 19.87%. During the vegetative period there is 317 mm of precipitation or 56.5% of the total amount. Rains are mostly excreted as drizzle, while rains are rarer.
Precipitates are excreted during the colder period of the year as snow. Snow usually starts falling during late November, and stops at the end of March. Thickness of the snow cover is small. Mean number of snowy days per year is 23.2.
Based on the analysis of climate elements, the region falls under temperate climate zone with pronounced continental characteristics. In its microclimate values, Karapandža is of the western Danube type (Bukurov,B.1975).

2.2.3 Flora and vegetation

Based on the analysis of the elements of flora, of the total number of recorded taxa (over 2000) more than half are very widespread.
Of far greater significance are the plants of narrower distribution of Pannonian floral characteristics, especially Pannonian endemics and sub-endemics, then Pontic, Sub-Atlantic and the most numerous Central European species, many of which are of relict type and are on the European and national Red List as endangered.

From the group of Pannonian sub-endemics one species stands out:
Hungarian hawthorn *Crataegus nigra*, which follows the flow of the Danube. It is a hydrophilic and heliophilic species which easily enters the structure of flood forests of willow, poplar, oak and ash of Podunavlje. The most beautiful groupings of the Hungarian hawthorn are in the protected area of the Karapandža, where they grow on beams, on the edges of oak forests. The species is on Serbia's Red List of flora.
Sub-Atlantic elements of flora
Typical representatives of this floral element are the lady orchid, Orchis purpurea and loose-flowered orchid, Orchis laxiflora, from relict family of orchids. They are located in the forests of Karapandža. Both species are on the Red List of the national flora.

Central European and European elements of flora
Among these floral elements, the most beautiful representatives of water macrophytes stand out, white and yellow water lilies, Nymphea alba and Nuphar luteum. They grow in branches of the Danube, ponds, oxbow lakes, as well as artificial canals: Bajski canal, Sirota canal and others. Due to the endangered status of their habitats, booth species of the water lily are protected in Serbia.
It is the same case with a rare water species of the water violet Hottonia palustris, which appears in the remnants of the old abandoned fish pond on Labudnjača. This aquatic plant is in the disappearing stage in these parts.
A type of orchid, the early marsh orchid, Dactylorhiza incarnata, is of European significance. It is found along with the loose-flowered orchid on wet meadows of the swamp vegetation of the preserve.
A type of the winter aconite, Eranthis hyemalis also shares that feature. It has been classified in the group of extremely endangered taxa in the Serbia's Red List of flora.

Adventive species – neophytes
Occasionally appearing rarer neophytes are also important to the flora of the Karapandža. Among them the sweet flag, Acorus calamus, stands out. The old disappearing culture which is protected as a natural rarity and species of water habitats, water fern Azzola filiculoides and tape grass Valisneria spiralis. Water fern is of tropical origin and spreads through zoochory, while Valisneria spiralis is a subtropical species, much rarer than the previous one.
The Karapandža region falls under azonal, hydrologically conditioned type of vegetation. Forests appear in alluvial deposits - type of hygrophillic forests and on loess terraces - type of hard-leaved forests. Besides, the appearance of wet meadows has been microlocationally conditioned, while the swamp and water types of vegetation have been conditioned in depressions.

Forests of the Gornje Podunavlje

Until artificial levees were constructed in the marshland region of Karapandža, in the floristic and vegetative aspect pond ecosystems dominated along with willow (*Salicetum albae* Issl. 1936) and poplar (*Populetum nigro-albae* Slav. 1952) communities, while communities with elements of Hungarian ash, birch and oak were only found in the highest areas (beams). After artificial levees were built, on higher and dryer parts of former floodplains, prevention of the flooding enabled the succession of the vegetation equalization of the plant cover. That process, as well as the previous one, was determined by humans according to their needs and visions of development of the area in the future. In certain natural and artificially raised stands of the oak and Hungarian ash, which have been, in accordance with syndinamic changes, formed since the ending of the XIX century in the habitats of willow, black and white poplar and Hungarian ash and birch, high productive effects have been achieved. Artificially raised oak stands and oak and hornbeam in the region of MU "Karapandža" represent an example of human ingenuity to define the direction of recent succession of vegetation on former habitats of willow and

poplar and create an area, sustainable in the trajectory over a century long - unique in central European forestry. In certain parts of the complex, oak stands have a volume of up to 800 m³/ha, (Simić M. 1987, Bobinac M. 2010), unequivocally confirm that the ecological optimum of that tree species is an information of encyclopaedic significance about production capabilities of these types of trees.

2.2.4. Fauna

Insect fauna
There are over 60 species of diurnal butterflies extant on the territory of Karapandža. Among the diurnal butterflies of the Karapandža, 32 are of interest for protection. Among them, three species are classified as endangered, 19 are in the vulnerable category, while 10 are in the rare category. Three species have been placed on the Red List: Thecla betulae, Apatura metis and Euphydryas maturna.

Ichthyofauna
SNP ”Gornje Podunavlje“ has 7.000 ha covered with water. Danube, with adjoining flood plains, according to the Regulation on protection of the natural rarities represents a habitat of six species that are under the first degree of protection. In the waters of the Danube, aside from autochthonous species of fish, there are species introduced near the beginning of the previous century. Allochtonous species are: the grass carp *Ctenopharyngodon idella*, silver carp *Hypophtalmichthys molitrix*, prussian carp *Carassius auratus gibelio*, brown bullethead *Ictalurus nebulosus*, pumpkinseed sunfish *Lepomis gibbosus*, largemouth bass *Micropterus salmoides* and others. Their number is difficult to direct due to the fact that they are in the open water. There are 64 species of fish in Danube, out of which, due to the water pollution, reduced navigable areas, construction of hydroelectric power plants and increase in number of allochtonuous species, the most endangered are: zander *Sander lucioperca*, common carp *Cyprinus carpio*, pike *Esox lucius*, catfish *Silurus glanis* and sterlet *Acipenser ruthenus*.
Riverbed and the floodplains of the Danube make up a unique system for habitation of the abovementioned species of fish, which live in the riverbed and feed and breed in the floodplains. This points to the need for active protection their natural hatcheries and fish stocking which is a significant measure in preserving the fish stocks.

Herpetofauna
Presence of nineteen species amphibians and reptiles has been established. Out of that, eleven are amphibians and eight are reptiles. That is almost half of the total number of species of amphibians and reptiles registered on the territory of the Republic of Serbia.
In amphibian fauna the following have been noted: the Danube crested newt *Triturus dobrogicus*, the smooth newt *Triturus vulgaris*, the European fire-bellied toad *Bombina bombina*, common spadefoot *Pelobates fuscuc*, common toad *Bufo bufo*, European green toad *Bufo viridis*, European tree frog *Hyla arborea*, agile frog *Rana dalmatina*, edible frog *Rana esculenta*, pool frog *Rana lessonae* and marsh frog *Rana ridibunda*.
In reptile fauna the following have been noted so far, single species of turtle (European pond turtle *Emys orbicularis*), four species of lizards (slow worm *Anguis fragilis*, European green lizard *Lacerta viridis*, sand lizard *Lacerta agilis* and wall lizard *Podarcis muralis*) and four species of snakes (Aesculapian snake *Elaphe longissima*, smooth snake *Coronella austriaca*, grass snake *Natrix natrix* and dice snake *Natrix tesselata*).
Most of the above mentioned species of amphibians and reptiles of this area are protected by the Rulebook on Declaration and Protection of Strictly Protected and Protected Wildlife Species of Plants, Animals and Fungi (Official Gazette of the RS 5/2010).

Avifauna
Avifauna is one of the foundational natural resources of Karapandža.

Black stork *Ciconia nigra* is on all international lists of endangered species. Contemporary population in Serbia is estimated at 110 nesting pairs, representing 1,5% of total European population. It nests in forested swamp regions of Vojvodina. The largest nesting place is in Gornje Podunavlje, where there are around 30-40 pairs. There are 2 pairs of black storks in Karapandža.(Source: Study of SNP "Gornje Podunavlje")

Heron colonies, i.e. significant nesting areas, which are one of the symbols of swamplands, are located in the region of Gornje Podunavlje. The most significant mixed colony is near Bezdan where the most numerous species are Black-crowned night heron *Nycticorax nycticorax*, little egret *Egretta garzetta* and grey heron *Ardea cinerea*, and there are only five pairs of squacco herons *Ardeolla ralloides*.
There are around 50 pairs of Greylag geese *Anser anser* in Karapandža. (Source: Study of SNP "Gornje Podunavlje")
Ducks (*Anas sp; Aythya sp*.) and geese (*Anser sp*.) gather in this area in large numbers during migratory and winter periods.

White-tailed eagle *Haliaeetus albicilla* is the largest predatory bird in central Europe. It can be found in all lists of endangered species on national and international level. Gornje Podunavlje is the main nesting area of this species in Serbia. Out of total number of pairs noted in Serbia, Gornej Podunavlje is a home to 30% of them. (Source: Study of SNP "Gornje Podunavlje")
Monitoring in 2011 has established the presence of 19 pairs in the Preserve, 2 out of which nest in Karapandža. Size of the population is growing, and it is being controlled by regular monitoring of the nests.

Theriofauna
Aside from Eurasian water shrew Neomys fodiens and European hamster Cricetus cricetus who are protected in this area by the Rulebook on Declaration and Protection of Strictly Protected and Protected Wildlife Species of Plants, Animals and Fungi (Official Gazette of the RS 5/2010), other widespread species of mammals are a blind mole Talpa caeca, Eurasian harvest mouse Micromys minutus, European beaver Castor fiber ...
Of beasts there are red foxes *Vulpes vulpes*, racoon dogs *Nyctereutes procyonoides*, least weasels *Mustela nivalis*, European polecats *Mustela putorius*, pine martens *Mertes martes*, beech martens *Martes foina*, European badgers *Meles meles,* European otter *Lutra lutra* and wildcat *Felis silvestris*.

Game fauna
Game is a significant resource of Karapandža. Protection and use of this resource have been determined by the Law on Hunting, Decrees on Establishing Hunting Grounds and applicable Hunting Principles.
Karapandža is a part of the "Kozara" hunting ground which covers the area of 11.764 ha. The hunting ground is under control of PC "Vojvodinašume" – LC Sombor. The hunting ground is by its geographic positions and other characteristics a natural system and is of the open type. It is open towards the Danube and the Hungarian border, and fenced towards the agricultural hinterland.
Hunting ground contains various species of big and small game, while the main species are: deer, roe deer and boar. Following species are protected and used as secondary: rabbit, pheasant, wild goose, wild duck, quail, and woodcock. Special mention should be made of very good habitable conditions of this area, forest-steppes, for breeding of red deer. The proof is continued survival of this autochthonous species in this area, excellent physical condition and health of the population as well as optimal real growth rate.

2.3. Landscape characteristics of the area

Landscape values of Karapandža have been shaped by the entire set of natural elements, including forests, waters, meadows and reed-patches with small villages on the edge and tourist-recreational content.
Forest in the Karapandža area, aside from having an important role in maintaining hydrological regime, along with meadow and water surfaces give a special value and atmosphere to the beauty of the landscape.
Mutual actions of various actors (geographic position, altitude, geological foundation, climate etc.) enabled the development of diverse forest communities that, with their characteristic composition, appearance, shape and colour dominate the region and give its basic tone.

Traditionally, the population of this area has been in the business of agriculture, animal husbandry, fishing, beekeeping, viticulture and forest exploitation. When the Preserve was declared some of these businesses were limited within the region of the Preserve.
Area management emphasises the significance of good cooperation with the local community. Additional opportunities for the cooperation of the local community and the Preserve should be sought in the development of sustainable tourism.

2.3.1. Spatial identification of planning purposes and the regime of land use

In accordance with the Regulation on protection of the Special Nature Preserve "Gornje Podunavlje", three degrees of protection are being established in the area of the Preserve.

Areas of high natural value and small mangement need are decleared zones of strict protection – I degree of protection	261.62 ha
Zones of active protection are areas which demant speacial type of management in order to preserve their values – II degree of protection	4 843.81 ha
Areas of low natural value and great management needs are declared the zone for use – III degree of protection	14 499.56 ha

First degree of protection areas

entails a ban on use of natural resources and excludes all other types of use of the area and activities except for scientific research and controlled education

I degree of protection localities in Karapandža are:

MU"Karapandža"		
Spoljna Kovačica-lake	Swamp-pond ecosystem	8,89 ha

Second degree of protection areas

The spatial distribution of areas in the II degree is as follows:

MU"Karapandža"	
Prodor	30.42 ha
Labudnjača	398.16 ha

The regime of II degree of protection, aside from prohibitions of the regime of III degree, following prohibitions are also in effect:

- logging, except if it is planned as a regular form of forest renewal, and replacing of autochtonous stands and groups of autochtonous species (substitution),
- felling of trees with white-tail eagle and black stork nests,
- introduction of allochtonous species of plants and animals, except for species of forest trees (if they are not invasive) that are already being managed on special bases,
- disturbing of species in their reproductive period,
- use of vehicles outside of the roads and during the reproduction of animals, except for needs of Preserve protection,
- use of motor boats, except of boats used by the security service,
- blocking of migratory paths.

Third degree of protection areas

Other areas of Karapandža covers the regime of III degree.

Protection regime of III degree prohibits:

- construction of industrial, agricultural and similar objects and performance of simalr work that would disrupt morpholofgical and hydrological characteristics of the terrain, destroy plant and animal life or the integrity of the area,
- collection and use of strictly protected species,
- draining of raw sewage waters,
- burning of reed,
- changing the purpose of areas, except for revitalization of natural habitats,
- forestation of ponds, depressions and meadows,
- exploitation of mineral resources, except for the needs of maintaining the waterway,
- opening and forming of landfills,
- construction of weekend facilities and weekend outside of construction areas determined by special planning and urban development documents,
- grazing of livestock.

ASSESSMENT OF THE STATE OF ENVIRONMENT OF THE PROTECTED AREA

Natural characteristics of Gornje Podunavlje oblige us to take care of their protection by most rational use of natural resources.
Region of Gornje Podunavlje is characterized by:
There is a special regime of waters of the Danube and its branches along with groundwaters in the protected area, that occasionaly drain, rise, flood and withdraw to their beds, creating meanders, oxbow lakes, small lakes, ponds, swamps and alluvial deposits;
Stands of autochtonous species of willow, poplar, oak and other species of trees are large natural resource with hereditary properties, which are by natural evolution diferentiated and incorporated in their constitution. These hereditary traits, adaptation to sepcific conditions of the flood plains, introduced species cannot have, although some of them show excellent growth and population increase charactersitics. Natural fund of autochtonous forests of the Gornje Podunavlje is one of the richest in thir distribution habitat, making them priceless.
Due to special regime of surface and ground waters who occasionally soak and moisturize this fertile soil and enrich the area with bodies of water, a diverse plant and animal life has developed which forms an extremely large number of different biocenoses in the relativelly small area;
Water ecosystems in this area are known by their high organic production that enables feeding of a large number of fish species. During the floods,there are favorable conditions for spawning of the fish, during that period this are is noted as a significant spawning site in this part of the Danube;
Fish and small animals and large amount of animal food in general, attract a large number of bird species, some of which are very rare or completely extinct in other areas. This area is famous not only as a habitat of resident birds, but as a sanctuary of a large number of migratory bird species during their migrations;
Specific distribution of plant formations, where forest alternate with ponds, wet meadows, steppe-like areas, makes this area into a last oasis of the red deer in Serbia;
Areas of oak forests and other autochtonous tree species in the region which is protected from flooding and in which deer, as well as other fauna elements can find much needed shelter during the floods;
Vulnerability of nature due to technological progress of the society should be reduced as much as possible. For the sake of preservation of extant natural resources, it is necessary to remove the negative anthropogenic factors and introduce active protection measures concerning following vulnerabilities:
Changed hydrological conditions
Reguation of hydrological regime in the protected area of the region
Fragmentation and isolation of the habitats
Reduced areas of natural habitats (salt marshes, wet meadows)
Change of the areas' puropse
Cesation of traditional uses of the areas (pastures, beehives, reed-farms)
Illegal construction of buildings and inadequate types of tourism
Spreading of allochtonous and invasive species

2.4. Long-term goals of protection, preservation, improvement and sustainable use

Program of management, protection and development of Karapandža defines the goals and principles of protection, improvement, use and development of specific values, as well as the entire area of the protected natural asset. Management plan has the aim to preserve the genetic, species and ecosystem diversity, sustainable use and promotion of Karapandža, containing the following long-term – general goals:
- Preservation of the inundated area of the Danube River and all of its basic characteristics,
- An inventory of flora and fauna, mapping of endangered plant species and habitats,

- Monitoring of natural resources,
- Revitalization of habitats,
- Active protection of key species and their habitats,
- Definition of jeopardizing factors, mitigation or elimination of the consequences of their activity,
- Favouring and improvement of autochthonous natural resources – application of measures of protection, rebuilding and revitalization of resource habitats, reintroduction of rare or endangered species,
- Preservation of landscape characteristics of the area,
- Ensuring sustainable use of natural potentials – forestry, hunting, fishing, tourism, recreation,
- Coordination of the allowed aspects of the use of natural resources and the needs for protection and preservation of the natural asset and evolving the sustainable development principle,
- Cooperation within the national and international network of protected areas and the development of optimal practice in management of such characteristic natural assets as well as the corresponding presentation of natural values of national importance within it,
- Establishment of visitor and research centres,
- Coordination of tourist, recreational, cultural and educational needs with the needs of local communities,
- Due to the dynamics of management process during the plan realization, there is a possibility of potential need for changes or necessary achievement of some goals. Based on the general goals, specific priority goals and activities have been defined.

2.5. Priority activities and measures of protection, status tracking and improvement of natural and created resources

Specific (priority) goals and activities in the program period from 2011 to 2020 are:
- Revision of the Special Nature Reserve “Gornje Podunavlje” Protection Act, which includes the Karapandža region;
- Development of nature-friendly tourism and the necessary infrastructure;
- Stocktaking of the flora and fauna, mapping the species and habitats;
- Monitoring of key species and their habitats;
- Active suppression of invasive plant species;
- Revitalization of water habitats – renovation of the contact between the river and old river branches according to specific projects (reconstruction of specific parts) and the increase of areas under water mirrors on localities Karapanadža - Sirota and old fish ponds. Active bird protection through measures of preservation of stands of autochthonous types of trees and preservation of particular trees necessary for nest building;
- Improvement of all types of cooperation with other users of the area and local communities concerning eco-tourism and the promotion of the Reserve;
- Presentation and popularization of natural resources of the area
- Intensification of scientific research and educational activities

3. SUMMARY

3.1. The nature conservational status of Karapancsa-Karapandža

The floodplain area on the left bank of the Danube is situated on the two sides of the Hungarian-Serbian border. The origin of the two side is similar: this was a continuous part of the ancient flooding area. Nowadays it lies mostly outside of the artifical dikes against the floods but beetween the main river channel of these days and the main channel of the times before the great river regulation works, called Ferenc-csatorna - Banjski Kanal today.
The whole area has relatively small extent from the viewpoints of climatology, geology and biogeography, therefore the effects which form the landscape can be evaluated as absolutely homogenous. The differences of the two sides come mainly from the dissimilar landuse.
Both protected area is covered mainly by forests with large proportion of artificially raised stands of different forest types.
The vegetation of the whole area – which is mainly continental with Pannonian and Submediterranean elements - is under edafic impact, the original vegetation was highly modified alluvial type compared to the zonal ones. The most productive forest types of course are used frequently everywhere and this is true in this area too. The actual conditions of terrain can make the management very hard and this can preserve habitats in the same turn. The most productive and originally species rich hardwood gallery forests and oak-hornbeam forests, moreover the softwood gallery forests of the upper flood area are felled and replanted many times, many cases were renewed with non native species. The habitats near the water bodies, marshes and the most wet habitats as well as the water bodies, channels and ponds themselves stay in natural state.
The Danube and its hidrological-morphological porcesses formed the land before the river regulations and these phenomenons are the highest values in our time too. Probably the most natural habitats of the area are the newly forming reef habitats, their herb vegetation in the beginning phase of the succession and the willow shrubs and softwood forests of the isles later. The marshes and swamps in the deeper landparts of the ancient river branches and oxbows are also very important and in the most cases are minimally in semi natural status but their longer existence unfortunately give many chance for the degradation.
One of the main threats for the natural habitat types nowadays is the invasion of alien species. This process affects the whole area really hardly not only because the „natural" process of expanding the populations along the river channels or through habitats but because of planting or introducing some invasive species in the heart of the flood area in the forest replantations which was followed by the expansion of these species.
Because of its long management history the area today is a strongly modified landscape wherein the main habitat types are similar in their basic character to the potential ones but are strongly modified and in many cases rather artificial. The dominant habitats in potential meaning are forests as well as in the existent landuse too, but the forest management of the centuries changed the forest stands radically. Unfortunately most of the forested areas are artificial plantations now, in best cases with the most valuable native species like oak and ash but at many locations non native or alien species – hybrid poplars, black nut, green maple, american ash - are planted.
The water bodies are also strongly modified, primarily by the river regulation works against floods and partly because of correction of waterways for shipping. The naturalness of water bodies is lowered by the changes of riverbed what is induced indirectly by the river regulations moreover by the climatic changes of the last decades.
In few words we can say that, despite of its distinct natural values, the whole landscape is strongly modified, most of its area is only semi natural in the best case. Fortunately the original flora and fauna still have great potential for regeneration. Therefore for the managing bodies of the nature conservation it is very important task to preserve the existing natural habitats and improve the modified ones. In the following chapter we give the guidelines of this elementary work.

3.2. The common aims of nature conservational management of Karapancsa-Karapandža

3.2.1. Forestry

The dominant habitat types are forests therefore the forestry has the most considerable effects among the management forms. The main goals of forestry are:
- preserve the remaining primaeval and natural forest stands
- greaten the proportion of autochtonous species, accordant to the actual habitats
- suppress the invasive plant species
- use nature oriented forms of silviculture, like natural forest regeneration and continuous forest cover method.

3.2.2. Water management

The Danube is the most characteristic element of the landscape and its biggest natural resource. The river is an important waterway and its floods endanger the human populations, therefore the river regulation is essential. The main goals of the water management are:
- preserve the natural processes of riverbed forming in the largest possible extent
- ensure the necessary water supply for the wet habitats
- ensure the good quality of the water bodies
- ensure and renew the connections of the different and originally interwoven water bodies
- controlling high speed boat traffic.

3.2.3. Fishing

Before the river regulations this management form has great economical importance but since those days the possibilities of fishing has fallen radically. For nature conservation nowadays the most important is to ensure the natural species structure of water habitats. The fish stocks are in direct connection with the quality of water bodies mainly in terms of naturality. For the succesful spawning the fish need natural and differentiated water habitats. The main goals of fishing management are:
- elimination of large scale economical fishing
- guard the fish stocks from overuse
- ensure the possible strongest populations of autochtonous species
- suppress the invasive alien species.

3.2.4. Hunting

The hunting also was a traditional use of landscape but in a different way opposite to the fishing. Hunting for big game was always the right of the landlords or owners of the area moreover possibility for the rich, the commoners could hunt only for the waterfowl and small game. Nowadays with the lack of the great predators the hunting has an important role in stock control beacuse the big game species has devastating effect on the habitats in case of overpopulation. Beacuse the high proportion of protected species among waterfowls this form of hunting is anachronistic. The main goals of hunting are:
- controlling the big game stocks
- elimination of waterfowl hunting.

3.2.5. Turism, education and research

The Karapancsa-Karapandža region is a bit uncared in this three, mainly cultural „usage" form. In the same time this area has great potential for all of this activities. If the use will increase this can be done only in a sustainable way. In this meaning the most important is to find and generate the best forms of tourism because overuse can affect negatively the habitats in short period of time.
To collect necessary base data for the nature conservation, education and also for tourism, very important to encourage the reasearch of the area.

EPILOGUE

The still existing autochtonous species and natural habitat types represent high nature conservational value what is unique along the middle section of the Danube. With the best use and management of the area the proportion of the valuable habitats can be increased what attaches to the good population status of the important species.

We hope the capabilities and possibilities will be given to protect this exceptional floodplain area in both of the countries and we can preserve its natural values for long times.

1 Danube Delta Biosphere Reserve **2** Srebarna Nature Reserve **3** Kalimok-Brushlen Protected Site **4** Rusenski Lom Nature Park
5 Persina Nature Park **6** Djerdap National Park **7** Gornje Podunavlje Special Nature Reserve **8** Kopački rit Nature Park
9 Lonjsko Polje Nature Park **10** Duna-Dráva National Park **11** Duna-Ipoly National Park **12** Dunajské luhy Protected Landscape Area
13 Záhorie Protected Landscape Area **14** Donau-Auen National Park **15** Donauauwald Neuburg Ingolstadt

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