

Additional Material

Ecological features

Various types of vegetation are developed in Gornje Podunavlje owing to the differences in the microrelief, the vicinity of the river, the pedological substratum, the geographical position, and the historical development of the vegetation. Besides the stands of aquatic and swamp vegetation in the marshland, aquatic and swamp stands in salty swales and ponds were also found, as well as stands of the meadow vegetation, from wet meadows, through fragmented remains of the steppe, to salt-marsh vegetation on the solonetz type substratum, as well as various types of the forest vegetation, from alluvial marshland to lowland forests. The presence of the nitrophilous and grassland vegetation is the consequence of the presence of game animals and the influence of humans. The vegetation of the area, from the phytocoenological aspect, comprises 16 vegetation classes, 27 alliances, 5 suballiances, 14 community groups, 57 plant communities, and 5 subcommunities. So far, 143 various syntaxonomic units were recorded. Communities of the herbaceous type (*herbosa*) dominate (44 communities or 77.2 %), while forest and shrubby formations (*lignosa*), with 13 communities (22.8 %), are less present. Most of the communities are of the primary character, which illustrates the important botanical diversity. The syntaxonomic overview of the plant communities follows (Panjković, *in* Kovačević *et al.* 2000; Panjković *et al.* 2004, Panjković, 2006):

Aquatic and swamp vegetation covers open areas in Gornje Podunavlje. Numerous plant communities of aquatic and swamp vegetation, apart from occupying large areas and determining the specific appearance of the landscape, have an important role in overgrowing and rising of the terrain, and are very important in the vegetation of Gornje Podunavlje. Aquatic areas of shallow ponds, edge parts of oxbows and by- channels, and slow running channels are covered by "water blossom" of duckweed, water ferns, and mosses, as well as bladderworts (*Lemno – Spirodeletum polyrbizae*, *Lemnetum gibbae*, *Lemno minoris – Ricciocarpetum natantis*, *Lemno minoris – Azolletum filiculoides*, *Spirodelo polyrbizae – Salvinietum natantis*, (*Lemno minoris– Riccietum fluitantis*, *Lemno minoris – Utricularietum vulgaris*), while immediately under the water surface the community *Lemnetum trisulcae* is developed. It is important to emphasize the presence of the community of duckweed and liverwort (*Lemno minorsi – Ricciocarpetum natantis*), for which the winter months represent the optimal period for development in Gornje Podunavlje. The communities of common hornwort (*Ceratophylletum demersi*), grass-leaved pondweed and water milfoil (*Potamogenetum graminei*, *Myriophyllo – Potametum*) are developed following the mosaic pattern in channels, ponds, and old by-channels. The community of water violet (*Hottonietum palustris*) is developed in the channel Sirota, representing a rare community in Vojvodina and Serbia. The community of water milfoil and water lily (*Myriophyllo – Nymphaetum*, subass.: *nymphaetosum* and subass.: *numphaetosum*) is frequent in lentic waters and covers wide areas. The largest areas are covered with the communities of yellow floating heart (*Nymphoidetum peltatae*, *Trapo – Nymphoidetum peltatae*, *Hydrochario – Nymphoidetum peltatae*). The shallow waters in Patajina Bara and Lake Srebreničko are decorated with the community of yellow floating heart and mare's tail (*Nymphoideto – Hippuridetum*), which spends part of the time in water, and another part in the wet silt. The aquatic community of pondweed and fan-leaved water-crowfoot (*Potamo – Ranunculetum circinatis*) is developed in the shallow lentic waters. After the water runs away, the community of needle spikerush (*Eleocharetum acicularis*) develops. During the summer months in deeper ponds dominates the community of water chestnut (*Trapetum natantis*). The vegetation of reeds (order *Phragmitetalia*) is developed around the edges of ponds and by-channels, where water partially remains, with the domination of reed (*Phragmitetum communis*), cattail (*Typhaetum angustifoliae*, *Typhaetum latifoliae*) and bulrush (*Scirpetum lacustris*), depending on the water. The community of sedges (*Caricetum elatae*, *Caricetum vesicariae*, *Caricetum gracilis*, *Caricetum ripariae*, *Caricetum rostratae*) give the characteristic appearance to the landscape, covering large areas. The communities *Glycerietum maximae* and *Phalaridetum arundinaceae* are developed in fragments, while the community *Oenantho - Rorippetum amphibiae* covers the swales in the alluvial part of the marsh during June.

Vegetation of silty banks is represented with the ephemeral community *Dichostylio – Gnaphalietum uliginosi*, the stands of which overgrow wet, silty, and sandy banks of ponds, river branches, channels, and riverbed, when the water runs away. It is mainly built by annual plants with short development time: *Dichostilis micheliana*, *Gnaphalium uliginosum*, *Heleochoa alopecuroides*, *Cyperus fuscus* and other species. Their full development occurs usually in the late summer or in the autumn.

Nitrophilous vegetation is developed along roads and on roads, along shallow ponds, and in places where the influence

of humans and game animals is strong, including smaller, narrow areas of very stamped, wet habitats that are silted and humid most of the year. At the end of the vegetation period the habitats become dry, hard, and dense. Most widely spread ruderal communities in wet ruderal habitats of Gornje Podunavlje belong to the communities of the alliance *Bidention tripartiti*. Communities *Polygono – Bidentetum*, *Ranunculetum scelerati* and *Alopecuretum aequalis* are also developed in wet ruderal habitats. The widespread community along roads in Monoštorski and Apatinski Rit is the community *Hordeetum murini*. The community *Lolio – Plantaginetum* is frequent in stamped areas, while the community *Sclerochloo – Polygonetum avicularis* is sporadic. The fragments of the stands of the alliance *Marrubion peregrini* of the ruderal community that is frequent in Vojvodina occur in stamped salty areas.

Meadow vegetation continues after the swamp vegetation, and it is primarily formed by felling and clear-cutting of forests or drying of ponds and swamps. It occupies very small areas, and its communities most frequently occur in fragments. The only mown meadows occur along the levee, ass. *Arrhenatheretum elatioris*, which in the same time serve for grazing of game animals. The meadow-steppe vegetation of continental salty terrains of the class *Festuco – Puccinellietea*, is represented by the alliance *Puccinellion limosae*, the stands of which are developed in the area of Štrbac, occupies inundated salty meadows on solonchak.

The edificatory species is the grass *Puccinellia limosa*, which is frequent on salty terrains, as well as *Camphrosma annua*, *Veronica incana* and other species. All these species are adapted to salty conditions of the habitat and build specific communities of narrow distribution in the Pannonian Plane. The presence of this alliance is conditioned by the high level of ground water in the spring and by drying of the soil in the summer, when the salt accumulates on the surface.

Šibljak vegetation in Gornje Podunavlje is represented by the alliance *Prunion spinosae* and *Corno – ligustrietum croaticum* that grown along the channels and in the protected areas of forests.

Forest vegetation comprises the widest areas of Gornje Podunavlje, and stretches as a belt along the river. In the lowest part, as a fringe community of Danube islets and sandbanks in Apatinski and Monoštorski Rit, a community of the almond leaved willow (*Salicetum triandrae*) is developed. The šibljak of purpleosier willow (*Salicetum purpureae*) comprises almost the lowest parts of the Danube islets and marshes, developing along ponds and swales. Of widest forest communities in the inundation area it comprises forests of the white willow (*Salicetum albae pannonicum*) that grows on river banks, by-channels, and ponds that are under influence of flood waters. Besides the white willow (*Salix alba*), with adventive roots on trunks, by which the tree develops during the floods, the following also occur – *Populus alba*, *Populus nigra*, *Salix cinerea*, *Salix purpurea* and *Salix triandra*, and of herbaceous species, depending on the water level – *Galium palustre*, *Agrostis alba*, *Myosotis scorpioides*, *Iris pseudacorus*, *Leucoium aestivum*, and other species. The community of white willow and black poplar (*Salici – Populetum nigrae*) grows on the somewhat higher terrain, where the floods do not last long, as well as the community of white willow and black poplar with the European dewberry (*Salici – Populetum nigrae rubetosum caesii*). Ash forests are fragmented and represent a rarity (*Leucoio – Fraxinetum angustifoliae*). The stands of alder (*Alnetum glutinosae*, *Alnetum glutinoso – incanae prov*, *Ulmeto – Alnetum glutinosae*) are also fragmented. The forests of grey willow (*Salicetum cinereae*) sporadically occur along the edges of the channels in this area. The community of the white and black poplar (*Populetum nigro – albae*) is developed on ridges, higher parts of the Danube terraces, where the floods are frequent but of short duration. Particularly beautiful stands can be found on the islets of Adice (Monoštorski Rit). Along with the species *Populus alba*, *Populus nigra* and *Salix*, the following can be found – *Crataegus nigra*, *Crataegus monogyna*, *Morus alba*, *Cornus sanguinea*, *Prunus spinosa*, *Rubus caesius*, *Lycopus europaeus*, *Galeopsis speciosa*, *Solanum dulcamara*, and other species. The stands of the black poplar today represent a rarity and do not recover naturally. The community of the white poplar and the Hungarian hawthorn (*Crataego nigrae – Populetum albae*) is developed as a fringe community on ridges in the unprotected part of Apatinski Rit, which are rarely flooded. Of tree species, the edificatory species is the white poplar (subass.: *typicum*), and sometimes pedunculate oak prevails. In the sector of the Danube, besides the relic pedunculate oak forests, the shrubby stands of the Hungarian hawthorn are also frequent: *Crataegetum nigrae prov*. The forest of white elm and narrow-leaved ash (*Frangulo-Ulmetum effusae*) continues after the poplar stands, with *Quercus robur*, *Populus alba*, *Populus nigra*, *Pirus piraster*, *Acer campestre*, *Alnus glutinosa*, wild grapevine *Vitis silvestris*, *Rubus caesius*, *Viburnum opulus*, *Morus alba*, *Crataegus monogyna*, and other species. Of herbaceous plants the following occur – *Festuca gigantea*, *Cerastium silvaticum*, *Stellaria neglecta*, *Carex caryophylla*, *Carex silvatica*, the species from the family of orchids – *Platantera alba*, and other species. Oak forests grow in the highest areas. The forest of pedunculate oak and dyer's broom (*Genisto elatae – Quercetum roboris*) grows on somewhat lower terrain. In the floodplain of the Danube, on alluvial pararendzines, where the floods are frequent and last longer, the forests of elm and ash with oak are developed (*Ulmeto – Fraxinetum prov*). Besides the cited oak forests in the Danube sector, the relic communities of pedunculate oak also occur: *Cariceto – Quercetum roboris "relictum"* and *Rubeto – Quercetum roboris "relictum"*. The more arid type of forest is the community of pedunculate oak and hornbeam (*Carpino betuli – Quercetum roboris*), the forest floor of which is enriched by *Epipactis heleborine*, *Impatiens noli – tangere*, *Brachipodium silvaticum*, *Geranium robertianum*, *Galeopsis speciosa*, *Geum urbanum*, *Poa nemoralis*, *Sanicula*

europaea, *Torilis arvensis*, *Carex silvatica*, and other species, which grows in the forest Crna Šuma on Karapandža, on Štrbac, and in the forest Kozara. These stands are relic, and are built of plant species that are threatened due to the loss of habitat.

Anthropogenic forest communities – Since Gornje Podunavlje is primarily a forest area, it has been used by humans for centuries. In the entire area there are almost no stands that are not influenced by man through forestry cultivating measures, such as thinning, felling, and planting of cultures, and unfortunately

clear-cutting. Anthropogenic forest communities in this area occur mainly as planted cultures, and more rarely as degradation stages. The most widespread are planted forests of the white willow (*Salix alba*) cultures, clones of the Euro-American poplars (*Populus euroamericana*), American green ash (*Fraxinus pennsylvanica*), American black walnut (*Juglans nigra*), and locust tree (*Robinia pseudacacia*).

According to the EUNIS habitat typology, the following basic levels are distinct:

- C1 – Natural eutrophic lakes with *Magnopotamion* and/or *Hydrocharition* - type vegetation
- C1 – Communities with the domination of bladderworts *Utricularia* spp. “colonies”
- C1 – Communities with the domination of aquatic ferns (*Salvinia*) – floating mats
- C1 – Water crowfoots (*Ranunculus* spp.) communities in shallow water
- C1 – Water violet (*Hottonia palustris*) beds in shallow water
- C1 – Oligotrophic to mesotrophic stagnant waters with the vegetation of *Littorelletea uniflorae* and/or *Isoetes* – *Nanojuncetea*
- C3 – Rivers with silted banks with the vegetation of *Chenopodion rubri* p.p. and *Bidentetion* p.p.
- C3 – Freshwater dwarf spikerush (*Eleocharis*) communities
- C3 – Pannonian river bank dwarf sedge communities (*Carex* sp.)
- E3 – Eutrophic humid meadows (*Juncus*)
- E5 – Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- E6 – Pannonian salt steppes and salt marshes
- G1 – *Salix alba* and *Populus alba* galleries
- G1 – Fluvial mixed woodland of *Quercus robur*, *Ulmus laevis*, *Ulmus minor*, *Fraxinus excelsior*

Noteworthy fauna

More than 60 species of butterflies exist in this area.

Among the butterflies of Gornje Podunavlje, 32 species are interesting from the aspect of protection. Among them, significant are *Thecla betulae* Linnaeus (fam. Lycaenidae) and *Euphydryas maturna* Linnaeus (fam. Nymphalidae).

In water and in very humid habitats, where the vegetation of aquatic and semiaquatic plants and of swamp meadows occur, specific insect groups are present. Among them significant are the mosquito larvae, mayflies, dragonflies, great diving beetle, silver water beetle, water scorpion, water stick insect, and other species. Of particular interest (faunistic, ecological, commercial, and aesthetic) are the species from the order Odonata - dragonflies. These species have found particularly favourable conditions for development in the habitats of Gornje Podunavlje.

Besides butterflies, the orders Diptera and Coleoptera (Carabidae, Coccinellidae, Dytiscidae...) are significant for the

number of individuals and species.

The species of the order Hymenoptera have a significant place in the entomofauna of Gornje Podunavlje, as well.

Ichthyofauna

The Danube is the most important open, lowland fishing water of the cyprinid type. The configuration of the banks of the Danube enables the existence of large alluvial areas overgrown with vegetation. For this reason, the areas of the permanent watercourse actively take part in the fish production, as well as the alluvial zone covered with water, the importance of which depends on the river water level and the duration of the floods.

The list of fishes includes commercial species as well, threatened in the Danube and in the alluvial zone (*Esox lucius*, *Barbus barbus*, *Cyprinus carpio*, *Orthobius barbatulus*, *Anguilla anguilla*, *Lota lota*, *Sander lucioperca* and *S. volgensis*).

The conservation of the species *Carassius carassius* and *Tinca tinca* is very important, since they are characteristic for alluvial areas that are receding, which cause the decrease of the population abundance of these species.

Along with the autochthonous species of our ichthyofauna, the Danube is today inhabited by fishes that are introduced either unintentionally or intentionally from North America, Asia, and Europe. The process of acclimatisation and naturalisation of some species is completed, while for others it is still under way. So far, 8 species of introduced fish were recorded from the families Cyprinidae, Ictaluridae and Centrarchidae (*Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Aristichthys nobilis*, *Carassius auratus gibelio*, *Pseudorasbora parva*, *Ictalurus nebulosus*, *Lepomis gibbosus* and *Micropterus salmoides*). These species, which at the first glance provide good commercial effects in fish ponds, upon reaching open waters, through competition for resources, cause negative effects on the autochthonous ichthyofauna, since their further spreading is impossible to control.

Herpetofauna

Gornje Podunavlje represents one of the last oases of wetlands both in our country and in the entire course of the Danube. As such, among other things, it represents a strong reproductive and diversity centre of the amphibian fauna – Amphibia, and the reptile fauna – Reptilia of the Pannonian Basin. The presence of 19 species of amphibians and reptiles was determined so far, of which 11 amphibians and 8 reptiles.

The fauna of amphibians in this part of Podunavlje includes both groups present in Europe. In the group of tailed amphibians (Caudata) the following were recorded: *Triturus dobrogicus* (Danube crested newt) and *Triturus vulgaris* (smooth newt). In the group of tailless amphibians – frogs (Anura), the following were recorded: *Bombina bombina* (fire-bellied toad), *Pelobates fuscus* (common spadefoot), *Bufo bufo* (common toad), *Bufo viridis* (green toad), *Hyla arborea* (common tree frog), *Rana dalmatina* (agile frog), *Rana kl. esculenta* (edible frog), *Rana lessonae* (pool frog) and *Rana ridibunda* (marsh frog).

In the fauna of reptiles, one species of turtles, four species of lizards, and four species of snakes were recorded so far. Of turtles, there is *Emys orbicularis* (European pond terrapin), and of lizards, *Anguis fragilis* (slow worm), *Lacerta viridis* (green lizard), *Lacerta agilis* (sand lizard), and *Podarvis muralis* (common wall lizard). Of snakes, there are *Elaphe longissima* (Aesculapian snake), *Coronella austriaca* (smooth snake), *Natrix natrix* (grass snake), and *Natrix tessellata* (dice snake).

Ornithofauna

Ornithofauna is one of the fundamental natural values of Gornje Podunavlje. The diversity of ecosystems, the specific large forest complexes of marsh forests and ponds, the Danube with its islets and wide alluvial zones, as well as the vicinity of Kopački Rit and the Hungarian national park Dunav-Drava, contribute to the overall ornithological richness and invaluable significance of this region for nesting, migration, and wintering of birds. Gornje Podunavlje has one of the richest and most diverse bird faunas in Serbia. A total of recorded species is 230, while it is estimated that this number is really as large as 280, which makes over 80% of the total bird fauna of Serbia. So far, the determined number of nesting species is 160, while around 145 are nesting in the present time.

The international and national significance of Gornje Podunavlje for the birds is great, both for species

that live there most of the year and for species that only stay shortly during the periods of migration and dispersion. For its generally known ornithological values, Gornje Podunavlje, namely the area of 30,000 hectares, is included in the registry of the areas of international importance for birds, according to the IBA project. The ornithological value reflects primarily in the richness of rare and threatened nesting species, and for its significance for migration and wintering as well.

Among the significant species are the following: shoveler (*Anas chapeata*), bluethroat (*Luscinia svecica*), great white egret (*Casmerodius albus*), purple heron (*Ardea purpurea*), and other herons that fly over or possibly occasionally nest. The honey buzzard (*Pernis apivorus*), icterine warbler (*Hippolais icterina*), river warbler (*Locustella fluviatilis*), collared flycatcher (*Ficedula albicollis*), black woodpecker (*Dryocopus martius*), green woodpecker (*Picus viridis*), lesser spotted woodpecker (*Dendrocopos minor*), garganey (*Anas querquedula*), and other species are also present.

Theriofauna

The specific distribution of plant formations, where forests alter over wide areas of steppic character, numerous reeds, swamps, and marshes enable conditions for a large number of animals. In these areas live 51 species of mammals. On the hunting grounds of Gornje Podunavlje, besides the red deer, one can also find roe deer and wild boar to which this area, with its flora and vegetation, offers ideal habitat conditions for development and survival. Among the significant species are *Erinaceus concolor* – eastern hedgehog, *Neomys anomalus* – Miller's water shrew, *Crocidura suaveolens* – lesser white-toothed shrew, *Arvicola terrestris* – water vole, *Ondatra zibethica* – muskrat, *Micromys minutus* – harvest mouse, *Lepus europaeus* – brown hare, *Vulpes vulpes* – red fox, *Nyctereutes procyonoides* – racoon-dog, *Mustela nivalis* – weasel, *Mustela putorius* – polecat, *Meles meles* – badger, and other species.

Ecosystem services

Social values

The social and cultural life of the inhabitants in the settlements of Gornje Podunavlje is linked to the ecological character of this area. The life of the people in these areas has always been connected with the Danube, the forests, and the marshland. Extensive fishery is an important commercial activity, along with forest usage, hunting, and commercial fishing. Dug channels are used for irrigation, but have also found their function as habitats of plants and animals, as well as bathing sites in the summer months. The tourism and recreation are best reflected in hunting tourism and sport fishing, although the ecological, nautical, and village tourism are developing ever more. The ethnographical richness has been preserved in surrounding settlements (Bezdan, Bački Monoštor, Kupusina, Sonta, and Prigrevica). Since several nationalities live here, a wide spectrum of folk costumes, characteristic folklore, and customs are present in this area. Many customs, being a part of the tradition, today have the character of manifestations, such as the Masked Carnival in Kupusina, Šokac Wedding with the "Grape Ball" in Sonta, cherishing the traditional folk songs from the old homeland (Lika and Banija) in Prigrevica, Apatin Fishermen Evenings held every month, the competition in making the fish stew "Golden Kettle", etc. The traditional dishes made from fish (fish stew, fish chowder, fish grilled on forked sticks) and game animals are prepared in this region. Boats and paddles are made from wood in local shops, and other specific things such as clogs and houseware as well. Fishing gear is made manually in the surrounding villages. The local beer made in Apatin is named after the marsh deer ("Jelen Pivo", jelen=deer), the symbol of the nature of this area, and it is consumed throughout Serbia.

Current scientific research and facilities:

The project of the Habitat Inventory and Mapping in the Special Nature Reserve “Gornje Podunavlje” is realised by the IUCN Office for South-East Europe, the Green Belt – PIN/MATRA, the Institute for Nature Conservation of Serbia, and the PE Vojvodinašume.

The Monitoring of Aquatic and Wetland Vegetation in the Special Nature Reserve “Gornje Podunavlje” is realised by the Institute for Nature Conservation of Serbia, and the PE Vojvodinašume.

The study and mapping of the white-tailed eagle and black stork nests, monitoring and bird banding are realised by the Society for Protection and Study of Birds of Vojvodina, the Institute for Nature Conservation of Serbia, and the PE Vojvodinašume.

The Geographical Research Society from Belgrade and the Scientific Research Society of Biology Students “Josif Pančić” from Novi Sad organised seven summer multidisciplinary research camps in the period from 1995 to 2005.

Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

The Institute for Nature Conservation of Serbia, the PE "Vojvodinašume", and the WWF perform permanent education of the local community, all interested parts, and users of the natural asset, on values and importance of the natural richness of "Gornje Podunavlje". The informative boards are placed in Sombor, Bački Monoštor, and in the Reserve. Printed material is distributed. Workshops are organised in Bački Monoštor, with the topic on local community participation in the improvement of the Reserve protection. The film "Gornje Podunavlje" was recorded and shown several times. The Volunteer Centre of Vojvodina organises international volunteer camps in Bački Monoštor.

Current recreational and tourism:

Tourism and recreation are best reflected in outing tourism, hunting tourism, and sport fishing, although ecological, nautical, and village tourism are also present. A large number of private weekend cottages are built throughout area. In once exclusive hunting areas Kozara and Apatinski Rit, hunting of large game animals represents a very expensive pleasure, but on these hunting grounds "hunting" can be done with a camera as well. One can have room and board at the hunters' huts "Mesarske livade" and "Štrbac". Boat, carriage, or jeep trips are also organised at the hunting grounds. One can obtain a daily, weekend, or seven-day fishing permit. It is possible to rent a fishing boat at fishermen organisations and at inns that are plentiful. Excellent specialities, with the best wine and tamburitza players, are offered at the inns "Harčas", "Vagoni", "Smuñ", "Zlatna Kruna", "Šaran", and other inns. Some of these inns, as well as the motel "Boja", have river strands. Longer stay lodging in Gornje Podunavlje is offered at several high-quality objects in Apatin and surroundings, such as the inn "Zlatna Kruna". Boat river trips along the Danube and boat trips to the Reserve are also organised. The project on village tourism development in Bački Monoštor is currently under way. The first festival of music, food, and crafts named "Bodrog Fest" was organised in Bački Monoštor in August, 2005.

Threats and responses

within the site:

The loss and fragmentation of the habitat is another ecological problem, particularly of natural forests of pedunculate oak, willow, white and black poplar, wet meadows, and ponds. The influence of humans changed the composition of forests as well. The number of oak forests is decreasing, and the number of forest cultures of Euro-American poplar, willows, and American green ash, which took habitats of alluvial forests, wet meadows, and swamps, increases. Therefore, the forestry today, as an economic sector, represents a great threat factor in Gornje Podunavlje. In the same time, forest monocultures change the normal regime of ground waters, namely decrease it. The level of ground waters in Apatinski Rit is decreased for 12 m, and foresters have to irrigate poplars. Old trees of pedunculate oak are dying as a consequence of the disturbed water regime.

These anthropogenic influences disturbed the spatial distribution and percentage of pond, meadow, and forest ecosystems, to the detriment of wet meadows that are disappearing and are very scarce in the area, as well as ponds, which are being overgrown, and natural forests, in favour of anthropogenic forest cultures that are spreading. Significant degradation and destruction of autochthonous alluvial forests, which reflects in mixed composition, age structure, and timber volume, manifests first of all in removal of old and rotten trees, general rejuvenation, uniformity and fragmentation of stands, etc.

Besides the habitat loss, another great problem are the invasive species of foreign origin, which have such competitive features that lead to changes in the structure of stands of the autochthonous phytocoenoses, and some even destroy communities and habitats, such as: *Amorpha fruticosa*, *Fraxinus pensilvanica*, *Acer negundo*, *Solidago gigantea*.

Grazing of cattle and pigs is not present today, but the rearing of game animals, particularly of wild boar and deer, has a significant influence on the renewal of the forests. Once, the meadows on Štrbac were mown, which prevented the overgrowing process and natural succession, and today these salty terrains are being overgrown with hawthorn and wild

pear.

The afforestation of large areas with plantation poplars significantly decreases the flood zone, which during the high water level represents the basic medium for natural spawning of the fish. Fishes are largely threatened by irrational and uncontrolled exploitation through commercial and sport fishing. Usage of illegal fishing gear (electro-fishing, explosives, poisonous substances, illegal nets and other gear) considerably threaten the fish stock, particularly the potential breeding material.

The illegal hunting or wounding of rare and threatened species of birds is also present, especially during migration and wintering. This relates to certain species of ducks and geese, herons, birds of prey, snipes, or songbirds. However, the period of the closed season for some game species is not strictly respected, and cases of collecting or hunters' actions on "extermination of pests" were recorded, which represents a particular problem on fishponds.

The river traffic on the Danube, as well as asphalt, forest, and village roads have negative effects such as pollution, disturbance, or habitat alterations.

Burning of reeds, emptying septic tanks in neighbouring channels and reeds, destruction of vegetation on fishponds, and aerial spraying also have negative effects.

in the surrounding area:

The waste waters of the city of Apatin that are directly discharged into the Danube represent a problem, since the filters are not functioning and the special channels were dig through which waste waters enter the river directly, and from there the alluvial areas downstream. Furthermore, the brewery in Apatin and the brick industry "Rapid" discharge their water into the Danube. Other polluters were not documented along the course of the Danube in the SNR "Gornje Podunavlje".

Other threat factors are also present, but are less evident. Occasional burning of reed and existing waste depots near Bezdán and Apatin also have negative effects on the natural environment. The application of agrotechnical measures and runoff from the surrounding cultivated fields enter the alluvial zone indirectly by ground waters and channels. It is noticed that septic tanks are being emptied into the surrounding channels and reeds near Bezdán.

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