



Biological Diversity of the Sava River Floodplain

The valley of the Sava River, the second largest tributary of the Danube, is one of the most significant reservoirs of biodiversity in the Pannonian part of Europe. This still preserved and vast floodplain along the river is comprised of exceptionally significant habitats for many globally threatened plant and animal species. The Sava River plains are most recognizable due for their impressive common oak stands, countless ponds and standing waters, river meanders and backwaters, and the large pastures created through centuries of human activity. The types of natural habitats found here, and are of broader, international importance, are certainly: the gallery woods of willows and poplars, the flooded forests of common oak and hornbeam, mixed floodplain forests, various aquatic and riverbank habitats with pond, floating and aquatic vegetation, Pannonian salt pastures, etc. Plant communities in the Posavina area stand out due to the great species richness, dominated by species ties to wet and aquatic habitats. Two species, which are included in the IUCN Red List of Threatened Species, are of particular interest: the water shamrock (*Marsilea quadrifolia*) and the waterwheel (*Aldrovanda vesiculosa*). These two aquatic plants are very sensitive to changes and destruction of aquatic habitats and today are exceptionally rare, and are found along the Sava at only a few, fragmented sites. The fauna of the Sava River valley has always attracted man with its diversity and richness. Many areas along the Sava have for ages attracted researchers, nature lovers and hunters, and some are have even become world renowned for the exceptional wealth of the living world within. What has attracted the most attention is certainly the remarkable wealth of bird fauna, in particular the wetland birds. Obedska bara is an example of this; due to the wealth of bird species found here, for many years it was one of the favourite hunting grounds of the Hapsburg royals, and was called an "Eldorado for birds". Unfortunately, today, the fauna of the entire Sava region is much poorer than just a few decades ago, due to changes to the natural water regime, amelioration, construction of embankments, and the destruction of forest habitats. Despite this, the Sava River even today has many very valuable habitats that provide shelter for important populations of rare and threatened species.

Among the birds, the wetland bird species certainly take precedence, and among these, the most important is the heron. A total of nine species of heron nest in the Posavina region, and the largest colonies are found at Obedska bara, Bardača, Jelas polje and Lonjsko polje. Though the white stork is abundant in the villages throughout Posavina (the village of Čigoć in Croatia is one of only a few European stork villages), the somewhat less abundant black stork (*Ciconia nigra*) is also characteristic of this area. Unlike its cousin, the black stork nests in hidden parts of floodplain forests. Yet another important bird species in Posavina, is the Eurasian spoonbill (*Platalea leucorodia*). This species is tied to the Lonjsko polje area and has a colony that nests in the Krapje dol bird sanctuary. Among the birds of prey, the best known is the white-tailed eagle (*Haliaeetus albicilla*), while other species are also noteworthy, such as the lesser spotted eagle (*Aquila pomarina*), black kite (*Milvus migrans*) and red kite (*Milvus milvus*).

The Sava River valley is also home to strong populations of large mammals, such as wild boars, roe deer and red deer, and are also important habitats for the wild cat (*Felis silvestris*), otter (*Lutra lutra*) and many bat species (*Chiroptera*). It is worthwhile noting that the beaver (*Castor fiber*), a species that was once widely abundance but disappeared due to habitat destruction and overhunting, has recently been reintroduced in the lower course of Sava. The wetlands and floodplains along the Sava River are important spawning and mating grounds for many species of amphibians and reptiles, such as Danube crested newt (*Triturus dobrogicus*), European tree frog (*Hyla arborea*), common spadefoot (*Pelobates fuscus*), fire-bellied toad (*Bombina bombina*), green frog (*Rana sp.*), grass snake (*Natrix natrix*), dice snake (*Natrix tessellata*) and European pond terrapin (*Emys orbicularis*). It is interesting to note that there is also a venomous snake species, (*Vipera berus*), found in the habitats along the Sava. The Sava River and its floodplain area, with countless ponds and backwaters, are rich in fish, as seen in the well developed fisheries that are a traditional activity here. The most characteristic fish species are the Wels catfish (*Silurus glanis*), zander (*Stizostedion lucioperca*), pike (*Esox lucius*) and tench (*Tinca tinca*). There are also many rarer fish species, such as the mudminnow (*Umbra krameri*), that is found at only two sites in the Sava River basin.





The Concept of Ecological Networks

European biodiversity is largely tied to ecosystems that are under direct or indirect anthropogenic influence. Though certain human activities can lead to increased biological diversity, in recent time our use of natural resources has been strongly intensified, which causes negative impacts on species and habitat diversity. As a result of human activities, habitats have become increasingly fragmented, thereby reducing the number of species and their distribution, as well as the value of goods and services that these natural resources provide.

The concept of ecological networks can be defined as *a system of areas between which there is not only an ecological but also a physical connection. It is typical that such a system consists of core areas, corridors, buffer zones and, in some cases, areas to be revitalized.* Generally speaking, the ecological network serves to achieve the following goals:

- to mitigate the negative impacts of habitat fragmentation;
- to enable species movements;
- to establish a functional connection between protected goods, thereby achieving a satisfactory state of species and habitats in line with the EU Birds Directive and Habitats Directive (Natura 2000).

The concept of ecological networks in Europe was first formally applied in 1992 with the EU Habitats Directive, which require the designation of sites of community interest in an European network entitled *Natura 2000*. The idea of developing ecological networks received an important stimulus in 1995, when 53 European countries decided to establish the Pan-European Ecological Network (PEEN) as one of the basic activities within the framework of the Pan-European Biological and Landscape Diversity Strategy (PEBLDS).

An Ecological Network Along the Sava River

There are several important processes taking place along the Sava River to support the development of a comprehensive network of sites. In Slovenia, the milestone was the development of Natura 2000 network according to the EU Birds and Habitats Directives defining eight Natura 2000 sites along the Sava River. In Croatia, the development of Natura 2000 network is ongoing as part of the EU accession process, drawing upon the national ecological network that has been proclaimed in 2007. Along the course of the Sava River flowing through Croatia, seventeen areas have been earmarked for the ecological network. These areas represent the largest complex of wetland habitats in Croatia. In Serbia, it is the Emerald network that currently lays the basis for the future ecological network. The Emerald Network is based on the similar principles as the Natura 2000 network, and is preceding the development of the Natura 2000 network in many EU Candidate Countries. Within the Sava River valley, two Emerald areas have been selected so far, the Obedska Bara and Zasavica Special Nature Reserves. In Bosnia and Herzegovina, there is a strong intention to designate new protected areas along the river that would lay ground for the ecological network, with amongst others the Bardaca Wetlands designated as a Ramsar Site.

Within the project *Protection of Biodiversity of the Sava River Basin Floodplains*, the experts have identified 51 sites in the four countries along the Sava River as the core areas of the network of sites. However, it is equally important to design the corridors that will enable habitat connectivity and species moving across the habitats, which makes the assessment of the in-between areas just as important as the assessment of the effectiveness of existing as well as future protected areas along the Sava River.





Protection of Biodiversity of the Sava River Basin Floodplains

The Sava River

The Sava river is the second largest tributary to the Danube River and is of biological significance because of its outstanding biological and landscape diversity. It hosts the largest complex of alluvial floodplain wetlands and the lowland forests in the Danube River basin. The Sava is an unique example of a river where the floodplains are still intact, supporting both floods alleviation and biodiversity. The total length from its source to the Danube is 950 km. It springs in Slovenia and runs through Croatia for 510 km constituting the border with Slovenia for 2 km, and with Bosnia and Herzegovina for 311 km and discharges into the Danube in Serbia. The most important landscape characteristics are found in the central Posavina with a mosaic of natural floodplains and cultural landscapes formed by traditional land-use patterns typical to the river valleys of Central Europe in the past. However, high value nature sites could be found all along the river, such as Odransko polje, Lonjsko polje, Bardaca wetlands, Gajna, Zasavica, or Obedska bara. Therefore, the river as a whole is considered by nature conservationists and scientists to be one of the "Crown Jewels" of European nature and has been selected as a focal region in the Pan European Biological and Landscape Diversity Strategy (PEBLDS) of the Council of Europe.

Project

One of the main challenges for the management of the Sava River is to reconcile economic development with sustainable use and protection of the landscape and biodiversity along the river. To secure the integration of the conservation concerns and overall ecological principles into the management of the Sava River, IUCN (International Union for Conservation of Nature), Wageningen International with technical support from Orbicon have jointly initiated the *Protection of Biodiversity of the Sava River Basin Floodplains* project to support the Sava Basin countries in identifying, designating and managing the biological and landscape diversity along the Sava River and in supporting the implementation of the EU Birds and Habitats Directives. The project is implemented in the partnership with the key conservation and land use institutions from the Sava countries – the State Institute for Nature Protection (Croatia), the Center for Ecology and Natural Resources of the Faculty of Science in Sarajevo, the Agricultural Institute of Republic of

Srpska, the Institute for Nature Conservation of Serbia, and the Institute of the Republic of Slovenia for Nature Conservation.

Objectives

The overall objective of the project is to protect and manage the unique landscape and biodiversity along the Sava River by supporting Bosnia and Herzegovina, Croatia, Serbia and Slovenia to:

- identify, protect and manage floodplain areas of importance for the landscape and biodiversity applying the criteria of the Birds and Habitats Directives;
- design a coherent transboundary ecological network of the core areas, buffer zones and corridors;
- introduce land use practices that support the protection of the landscape and biodiversity;
- raise awareness on the need to protect and manage the unique landscape and biodiversity along the Sava through transboundary co-operation.

Activities

In order to achieve these, an inventory of the biodiversity along the Sava River has been carried out with specific focus on the habitat types and species annexed under the EU Birds and Habitats Directives. However, the conservation of biodiversity and the design of a viable ecological network along the Sava River is inextricably linked to the full understanding and preservation of dynamics that exist between the ecosystems and human activities. The preservation of landscapes and biodiversity implies the maintenance of some extensive live stock grazing due to the specific biodiversity features of the Sava floodplains that are directly linked to the traditional land use that has shaped the area for ages. Therefore, an assessment of traditional and ongoing land use activities and their relevance for maintaining the landscape and biodiversity has been undertaken in order to enable the local communities to sustain traditional extensive agriculture, especially livestock grazing and to adjust their farming practises to the protection needs.

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Traditional Land Use Along the Sava River

The great wealth of biological and landscape diversity found along the Sava River, and the conservation of that diversity is largely dependent upon traditional forms of land use. Traditional forms of land use imply the manner and conditions of land use and adaptation to the natural environment that have been in place for 200 years or more.. The rich history of the area along the Sava is evident today, primarily in the characteristic architecture and the distribution of residential and agricultural areas.

Traditional forms of land use, such as grazing and mowing, together with the natural activity of the river, have created the present day characteristic appearance of the area as a whole. The most important landscape properties are seen in the middle reaches of the Sava River basin, where natural floodplain areas alternate in a mosaic-like pattern with cultivated areas. The Sava is still a river with pristine floodplain areas that both increase biodiversity and prevent flooding. This part of the Sava River represents a unique landscape and ecological system of flooded river areas that arose due to the joint impacts of natural flooding processes and human activities. Large floodplain areas, like those in the Lonjsko Polje Nature Park serve as retention areas for high waters of the Sava and its tributaries, thereby preventing floods, while in the summer months, turn into vast pastures where indigenous breeds of

horse, cattle and pigs still graze freely. The best known indigenous breeds of the Posavina region are the Turopolje pig, Mangulica pig, Croatian Posavina horse, and Slavonian-Syrmian Podolian cattle.

Agriculture is the widest activity in all the countries of the region. The mosaic-like landscapes found along the Sava were formed by traditional agriculture that in turn has created habitats rich in plant and animal species. The traditional grazing system is still present today along the entire course of the river, in the large complexes of common pastures. Maintaining the grassland surfaces through grazing secures the survival of these habitats, and the survival of numerous threatened plant and animal species. Conservation of the recognisable landscapes and biodiversity along the Sava implies the continued maintenance of extensive agriculture.

Forestry as an economic branch is important in land use, considering that a significant portion of the Sava River area is covered with lowland flooded forests of willow, poplars, common oak and narrow-leaf ash. In fact, the largest complex of alluvial lowland forests in the Danube basin lies along the Sava, that are increasingly managed in line with ecological, social and economic standards (FSC certificate).

