

## Additional information

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### Ecological character:

The riverbed is lined by (*Polygono hydropipero-Salicetum triandrae*) community. The extremely resistant willow species: (*Salix alba*, *S. triandra*, *S. purpurea*, *S. viminalis*) tolerate flooding, drought and icy inundation and grow bush-sized on the deposit laid down by the river. Sailing on the River Tisza, we can see that this community along the banks of the river is almost unbroken. Forests in the bank zone consisting of autochthonous willow and poplar groves (soft-wood groves, *Salicetum albae-fragilis*) are of great environmental value. Three tree species can be found in soft-wood gallery forests: White willow (*Salix alba*), White poplar (*Populus alba*) and Black poplar (*Populus nigra*). During natural renewal, one of these trees has bigger patches and becomes dominant in the tree stratum. Unfortunately the number of those stands is very low where we can admire huge, old White or Black poplars—it is more often that we meet a lonely tree in planted forests. The shrub stratum of soft-wood galleries along the Tisza has only allochthonous species. The Box elder (*Acer negundo*) and the American ash (*Fraxinus pennsylvanica*) spread by foresters find their optimal conditions in the flood plain, their seedlings may become dominant in the herb stratum, they are common in the shrub stratum and sometimes form the lower tree stratum. The herb stratum of poplar communities in the flood plain resembles that of (*Polygono hydropipero-Salicetum triandrae*) communities. The following bog species are common: (*Carex gracilis*), the Yellow iris (*Iris pseudachorus*), the Gipsywart (*Lycopus europaeus*), the Yellow loosestrife (*Lysimachia vulgaris*), the Bittersweet (*Solanum dulcamara*) and the Comfrey (*Symphytum officinale*).

Embankments are lined by the so-called 'navvy forests'. In this zone we find the ditches of which the embankments were built. These ditches have bog vegetation; their flora is of great value. The most characteristic tree species is the White willow (*Salix alba*) of which the lower branches and twigs are regularly cut down, so their trunks are bare so they have a big 'head' and they are called 'pollarded willows'. The wickers of these willows were used to reinforce the dykes. One reason to preserve these willow assemblages is that old willows become hollow thus providing a habitat for hollow-dwelling birds, the other is their cultural significance – their scenic value is significant. Their herb and shrub strata are similar to that of soft-wood galleries. The beautiful *Leucanthemum serotinum* and the Summer snowflake (*Leucojum aestivum*), both protected, are common in the fringe of the forests of the River Tisza. As the most important role of these forests is to preserve dykes, their handling involves longer shifts of cutting, so there is more chance to create nature-like assemblages than in case of hybrid poplar forests treated with shorter shifts of cutting. If the flood plain is narrow, the gallery woods at the banks and the 'navvy forests' may overlap but the middle part of the flood plain is usually occupied by hybrid poplar assemblages whose territorial proportion is the highest in Csongrád county's flood plains.

Plantations, consisting of allochthonous species planted in checkrow, treated with intense short period cutting after thorough preparation of the soil, cannot be considered real forests. High proportion of invasive and weed species are characteristic here. Forests with significant number of allochthonous species but the same structure as autochthonous forests can be of great natural value as their avian fauna is rich, heron colonies breed here and protected and strictly protected birds also build nests. Natural relevance of soft-wood galleries is common, still, the largest part of the flood plain forests is planted and their structure and species composition are far from natural.

Natural forests of the higher inundation area are oak-ash-elm (*Fraxino pannonicae-Ulmetum*) groves. Genuine, natural hardwood groves do not occur along the River Tisza in Csongrád county but some planted Pedunculate oak assemblages of different age are to be found in the flood plain and the protected inundation area too. Their herb stratum is poor in the flood plain, and due to the floods, species of natural hardwood forests cannot survive here. Grasslands in the site are usually hayfields with Meadow foxtail (*Alopecurus pratensis*), *Phalaroides arundinacea* and Reed sweet-grass (*Glyceria maxima*) stands. Those along the flood plain form transitions with moor communities creating a mosaic pattern. Their area is very small. In order to maintain flood plain hayfields human treatment is needed (without such treatment, the area is invaded by *Amorpha fruticosa*, an invasive acacia species,

or later soft-wood groves may evolve during a longer period of time) but then we lose grassland like species, biocoenoses and scenic values. The planted grass of dykes also has natural significance because it can provide a habitat adequate for wild plant and animal species and can become nature-like.

The most important protected species of the Tisza flood area are: *Leucanthemum serotinum*, the Summer snowflake (*Leucojum aestivum*), Meadow clematis (*Clematis integrifolia*) which are most common between the forest and the dyke, the Hungarian milk vetch (*Astragalus contortuplicatus*) is a rare protected species. The lost natural biotope along the River Tisza to be presented, the moor, was the most characteristic biotope at the end of the eighteenth century. It is the typical biotope of boggy bottom-lands, shallower ditches beside the dyke and silt-up backwaters. Their area is not significant and strongly fragmented. Zones dominated by *Schoenoplectus lacustris*, the Branched bur-reed (*Sparganium erectum*), the Flowering rush (*Butomus umbellatus*), sedges (*Carex* spp.), (*Phalaroides arundinacea*), the Purple loosestrife (*Lythrum virgatum*, *L. salicaria*), the Common reed (*Phragmites australis*) and the Bulrush (*Typha latifolia*, *T. angustifolia*) form zonation complexes depending on water depth. If there are shallow, open water surfaces in the moor, these offer especially valuable feeding place for birds; however, their amphibian fauna is rich also. Fortunately this biotope is able to regenerate quite easily. It quickly develops in ditches (even artificial ones) with adequate depth and water supply.

The significance of backwaters in nature conservation is very big, however, the pressure, due to human utilization, is also heavy. As they may develop naturally, natural still water assemblages formed in the river bends cut off, and without disturbance, by natural succession they more and more look like moor assemblages. Different floating, submerged and rooted weed communities appear in them. Characteristic species of floating weeds are duckweed species (*Lemna minor*, *L. trisulca*), *Salvinia natans*, an interesting, protected water fern, and *Ceratophyllum* species which float under the surface of water. Typical submerged weeds include: the serrate-leaved Water-soldier (*Stratiotes aloides*), *Hydrocharis morsus-ranae* and the Common bladderwort (*Utricularia vulgaris*), a yellow-flowered species which grows insect catching saccules. The so-called water lilies are the most beautiful: besides the protected denominator, the White water-lily (*Nymphaea alba*) we can find the yellow-flowered Yellow water-lily (*Nuphar lutea*) and the Water chesnut (*Trapa natans*) known from its interesting, hooked, chesnut-like fruit. The aim of nature conservation is to conserve all succession states. In order to achieve this, oversilting must be prevented in certain places. The condition of backwaters in the southern Tisza is quite different. The ones on the flood-protected side are usually strongly built in, polluted, ploughed till the banks, damaged by irrigation works and holiday resorts but there are exceptions. Backwaters in the flood plain are in better condition, regular floods help their survival.

Some allochthonous and invasive plant species can take advantage of these unnatural conditions and invade the place of certain species in forest communities such as *Amorpha fruticosa*, *Echinocystis lobata*, *Acer negundo*, *Vitis riparia*, *Fraxinus pennsylvanica*. The most important spreading factor of the seed of the alien species is the floods. Usually general forestry management is also unfavourable in the floodplain region because of intensive planting of adventives *Populus x euramericana* and other artificial hybrid poplar and willow races, exploitation of natural forests in young age and execution of large clear-cuttings so providing in this way good opportunity for adventive invasive plants to spread intensively.

Artificial hybrid poplar races made serious genetic pollution - by pollination - in the natural *Populus nigra* populations, so genetically unpolluted *Populus nigra* populations are close to extinction.