Tiscia (Szeged) Vol. XIV. pp. 89—104 (1979)

REGION RECONSTRUCTION OF THE TISZA DEAD-ARM AT LAKITELEK ON THE BASIS OF THE ECOLOGICAL INVESTIGATIONS PERFORMED IN TŐSERDŐ

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(Received 20 September 1978)

Abstract

It can be ascertained on the basis of the plant ecological investigations carried out in Tőserdő and the Tisza Dead-Arm at Lakitelek that these Tisza reaches, in spite of the anthropogenous effects, are suitable for the region reconstruction. In the forests along the Dead-Tisza several autochthonous tree species revive even today and the macrovegetation of the dead-arm is abundant, as well.

Conditions of executing the region reconstruction are:

(a) Owing to the siltation of the river bed taking place since the river control, rising of the water-surface of the dead arm by 1 to 1.5 m.

(b) Safeguarding a slow flowing through the dead-arm, in compliance with the water movement, correnspondig to the meanders before the river-control. After creating these physical conditions. the reintroduction of the plant and animal species which were characteristic of the water and river-side associations but exterminated because of anthropogenous effects.

Introduction

One of the areas of high priority of the Tisza research is the region of Csongrád. The investigations performed here are justified first of all by that in the near future the building of River Barrage III in Hungary begins, connected with the so-called Alpár Reservoir. The Tisza Dead-Arm at Lakitelek and Tőserdő, in the vicinity of the planned Reservoir, represent great natural value and have, therefore, been, already since 1955, nature conservation areas. Since 1975, they have composed one of the blocks of the Kiskunság National Park the area of which is 382 ha (KOPASZ 1976). This Tisza Dead-Arm and its environs are comparatively free of anthropomorphous effects, thus they are suitable to re-establish the pre-regulatory Tisza landscape. The aim of the plant-ecological investigations performed in the area is first of all to promote the region reconstruction initiated by the Tisza-Research Working Committee.

Literary survey

The first botanical description of Tőserdő originates from 1896. L. BAGI is writing in his book "Kecskemét múltja és jelene" (Past and present of Kecskemét) as follows: "The nicest forest of Kecskemét is Tős along the Tisza, consisting mainly

of oak plantations, interspersed with maple-trees, poplars, alders and ash-trees, hazel and broom bushes while farther, at the dam, the willow becomes dominant... The hop twists itself round trees, intertwined with bramble-trailers. Here and there wild vines can be seen as they wind round trees."

Its association relations were first elaborated in detail by I. BALOGH in 1951. In 1953, in the framework of the national plant-geographical surveying, L. TIMÁR worked in this area. He describes in greater detail the vegetation of the fenwoods and gallery forests along the Tisza of which the dominating willow-plantations are characteristic *(Saliceto populetum albae)*. According to TIMÁR, the groves extending along the dams are generally pastured. Their underwood is, therefore, very weedy *(Aristolochia clematitis, Physalis alkekengi, Urtica dioica, Agropyron repens)* and *Rubus caesius* occurs in large mass.

During the 25 years since the survey considerable changes have taken place. The forests along the dead-arm are cultivated. There occur introduced, plantation-like cultivated forests, as well. The branches of the old willows are no more pruned regularly. But from the shape of trees, the earlier frequent prunes can be concluded. *Amorpha fruticosa* and *Vitis riparia,* occurring today already in large numbers, are not mentioned by TIMÁR. The two plants multiplied, therefore, in this area in the last decades. In SIMON's opinion (1969), the forest types *Salicetum triandrae, Salicetum albae fragilis,* and *Fraxino pannonicae-Ulmetum* which are characteristic of the flood-plains along the Tisza, have mostly survive in Tőserdő.

CSAPODY and SZODFRIDT (1970), surveying the natural plant associations of the country, suggest Tőserdő as the main conservation area of Salicetum-albae fragilis. The region reconstruction initiated by the Tisza-Research Working Committee in the area is, therefore, unambiguously justified.

Materials and Methods

The Tisza Dead-Arm at Lakitelek and Tőserdő lie 30 km east of Kecskemét. Their geographical co-ordinates are: longitude 19° 30' east, latitude 46° 45' north. Tőserdő and its environs are shown in Fig. 1.

Its height above sea level is 80–90 m, its soil is sporadically peaty alluvial soil. The dead-arm is joined from west by an area with sand-hills. Its climate is continental the extremities are, however, considerably reduced by the flood plain. The mean annual temperature is about 10 °C. The many years' average of the mean January temperature is −1.8 °C and that of the mean July temperature is 21.9 °C. The mean annual precipitation is 497 mm. The area gets under water in case of major floods. This at last happened in 1977.

Our investigations were performed in three forest stands on the northern river-side of the northern dead-arm, 2 to 4 ha each, in the Summer of 1977 (Fig. 2).

At marking out the stands, we have taken into consideration the request of the Kiskunság National Park. These stands are the following:

(a) *Salicetum albae-fragilis* ISSLER 26 (type of the willow plantation),
(b) *Salicetum albae-fragilis* ISSLER 26 (type of the poplar plantation,
(c) *Fraxino pannonicae-Ulmetum pannonicum* Soó 63 (consolidation of *Quercus robur)*.

The coenological surveyings were performed in stands, in three repetitions, and in 20.20 sq.m squares. The covering of the single layers and the participation of species were determined with assessing, according to Braun–Blanquet's scale. The height of the forest was similarly established with assessing. The distribution of species according to floral elements and way of life was determined in pursuance of Soó (1964). In the appointed stands, and for a basis of comparison, a stand-climatic examination was carried out in the open plough-land, on two occasions, all day long. The micro-climate of the dead-arm was measured, as well, thus conclusions could be drawn in respect of the effect of dead-arm and forest upon the micro-climate. In the course of our investigations, the temperature of air was measured with alcohol thermometers in five strata depending on the plant stand, in two strata, with mercury thermometers, the temperature of the soil, and in the dead-arm those

of water and mud. The intensity of illumination was measured with luxmeter, the speed of wind with hand cup anemometer. The vapour content of air was determined with Assmann's aspiration-psychrometer, and the temperatures of the soil and water-surface with thermistor spot-thermometer.

Simultaneously with the coenological surveyings, the total leaf-surface falling on 1 sq.m of the herb stratum was also determined, as well as the wood mass of the three forest types, by means of forest valuation tables.

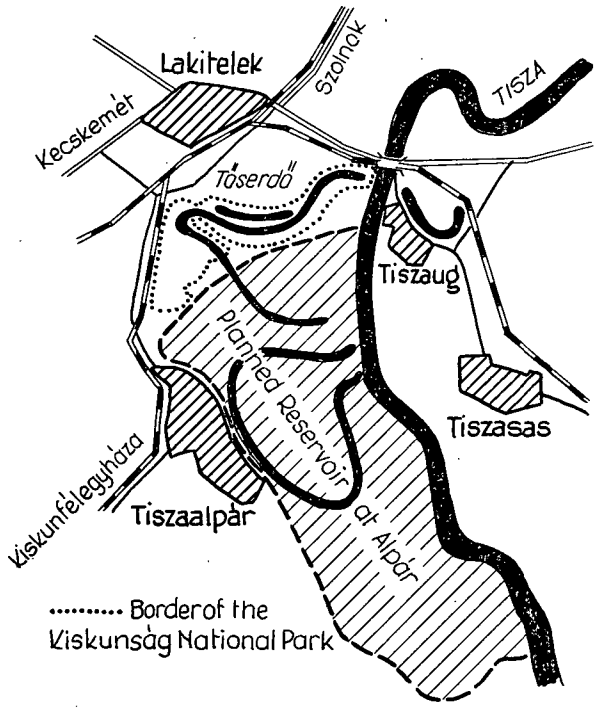


Fig. 1. Tőserdő and environs.

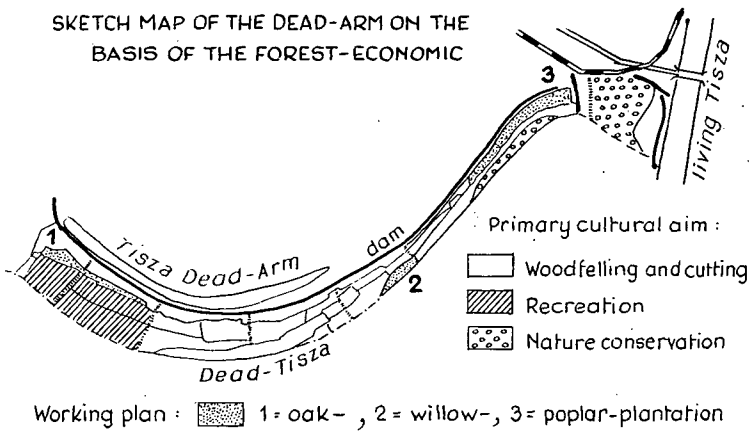


Fig. 2. The investigated stands along the northern part of the dead-arm.

Table 1. *Species composition of Salicetum albae fragilis* ISSLER 26 (willow type)

Floralelement	Life form	Species	Surveys					K	A-D
			1	2	3	4	5		
Tree stratum									
Eura	MM—M	Salix alba	4	5	5	5	1	5	4
Eur	MM	Fraxinus angustifolia ssp. pannonica	3	2	1	1	–	4	1,75
Adv	M—E	Vitis riparia	2	+	+	+	–	4	0,5
Eura	MM—M	Populus nigra	–	–	2	–	1	2	1.5
Adv	MM	Morus alba	–	+	–	1	–	2	0,5
Eura	MM—M	Salix fragilis	–	–	–	–	5	1	5
Shrub stratum									
Adv	M	Amorpha fruticosa	1	–	–	5	5	3	3.7
Eur	MM	Fraxinus angustifolia ssp. pannonica	5	–	–	2	–	2	3.5
Adv	M—E	Vitis riparia	+	–	–	–	–	1	+
Adv	MM	Morus alba	–	–	–	+	–	1	+
Herb stratum									
Eur	MM	Fraxinus angustifolia ssp. pannonica	5	2	+	1	+	5	1.6
Eura	H (N)	Rubus caesius	1	3	1	3	+	5	1.6
Adv	M—E	Vitis riparia	1	2	1	2	1	5	1.4
Adv	M	Amorpha fruticosa	+	+	2	+	2	5	0.8
Eur-Med	MM—M	Quercus robur	1	+	1	+	+	5	0.4
Atl-Med	G	Leucojum aestivum	+	+	+	+	+	5	+
Kozm	H	Potentilla reptans	+	+	+	+	+	5	+
Eur-Med	H	Carex sp.	+	–	4	+	5	4	2.3
Eura	Ch	Solanum dulcamara	–	+	+	1	1	4	0.5
Cir	G	Equisetum arvense var. ramulosum	+	+	–	+	+	4	+
Eura	HH	Lycopus exaltatus	–	+	+	+	+	4	+
Med	H (G)	Aristolochia clematitis	2	3	–	2	–	3	2,3
Eur	H	Symphytum officinale	+	2	–	2	–	3	1.3
Kozm	H	Urtica dioica	–	1	–	1	+	3	0.7
Eura	Th	Polygonum minus	–	+	–	1	+	3	0.3
Kozm	H	Calystegia sepium	–	–	+	+	1	3	0.3
Kozm	Th	Bidens tripartitus	–	–	+	+	+	3	+
Eur-Med	G	Iris pseudacorus	–	+	+	–	+	3	+
Cir	H (G)	Stachys palustris	–	–	+	+	–	2	+
Kozm	Th	Xanthium strumarium	–	–	+	–	+	2	+
Eur	MM—M	Ulmus minor	+	–	–	–	–	1	+
Adv	MM	Morus alba	+	–	–	–	–	1	+
Cir	H	Galium palustre	–	+	–	–	–	1	+
Eura	H	Myosotum aquaticum	–	–	–	+	–	1	+
Eura	Th	Cuscuta australis	–	–	–	–	+	1	+

Discussion and evaluation of results

Coenological description of stands

Salicetum albae fragilis ISSLER 26 (willow type)

It developed close to the water, in a low stratum, having two types. One of these is formed by parky old, *stick-like* willows, with young ashes and a few mulberry trees. The shrub stratum is low, its covering is of small size, and that of the herb

stratum is middle-sized. The characteristic species of these two strate are: *Fraxinus angustifolia* ssp. *pannonica* seedlings, *Rubus caesius, Vitis riparia, Amorpha fruticosa Aristolochia clematitis, Symphytum officinale, Leucojum aestivum. Vitis* creeps sometimes up to the tree stratum, as well.

The soil of the other type of willow plantation is wet, in some places the water cover even exists in the second half of July.

The willows in this type are lower and they are "bearded" until about 2 m height. Apart from *Salix alba, S. fragilis* also appears. The shrub stratum is unimportant, the herb stratum is very unequal: its cover changes between 0 and 80 percent.

Our coenological survey is summarized in Table 1.

Among the species, the Eurasian elements are dominating but there are also several cosmopolitan and adventive elements.

From among life forms, phanerophytons and Hemikriptophytons dominate. This agrees with the data published by SIMON (1957) about the forests in the northern Great Plain, but the proportion of geophytons is here higher (Fig. 3).

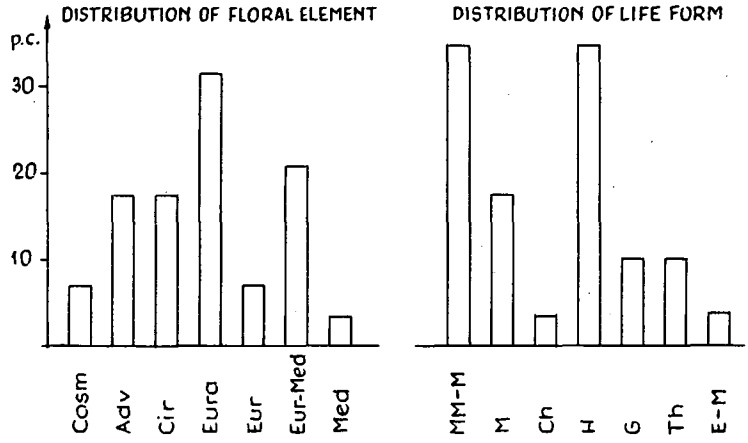


Fig. 3. Distribution of the floral element and life form of *Salicetum albae fragilis* ISSLER 26 (Willow type)

Salicetum albae fragilis ISSLER 26 (poplar type)

It takes place close to the dead-arm but in a stratum 1.5 to 2 m higher than the willow type. The forest mostly consists of *Populus alba* and *P. canadensis* but there occur among these *Populus canadensis* and, close to the water, *Salix alba,* too.

The forest is parky, the shrub stratum is well-developed. Its dominant species are: *Amorpha fruticosa, Fraxinus angustifolia, Celtis occidentalis, Morus alba, Frangula alnus, Crataegus monogyna, Ulmus minor.* It occurs that the latter species form a second shrub stratum above the strongly closed *Amorpha fruticosa* stratum. *Vitis riparia,* creeping often on the trees, as well, is characteristic of the stand.

The herb stratum, as compared with both "willow types", is richer in species and here are the dicotyledons dominant. It depends on the shrub stratum, how closed it is. Its dominant species are *Rubus caesius* and *Aristolochia clematitis.* There are many *Amorpha fruticosa,* as well as *Celtis, Frangula, Ulmus, Crataegus* seedlings and young shoots. And even *Populus alba* and *Quercus robur* occur.

Our coenological survey is summarized in Table 2.

Table 2. *Species composition of Salicetum albae fragilis* ISSLER 26 (poplar type)

Floralelement	Life form	Species	Surveys 1	2	3	4	5	6	K	A—D
Tree stratum										
Eur	MM—M	Populus alba and canescens	4	3	4	3	4	4	5	3.7
	MM—M	Populus canadensis	4	2	3	3	2	2	5	2.7
Eura	MM—M	Salix alba	–	3	–	–	2	–	2.5	1.7
Adv	M—E	Vitis riparia	–	2	–	–	+	+	2.5	0.7
Adv	MM—M	Morus alba	–	–	–	–	+	–	0.8	+
Eura	MM	Fraxinus angustifolia ssp. pannonica	–	–	–	–	+	–	0.8	+
Shrub stratum I										
Adv	MM	Celtis occidentalis			3	2			5	2.5
Adv	MM	Morus alba			2	2		+	3.3	2
Eur	MM	Fraxinus angustifolia ssp. pannonica			2	+		+	3.3	1
Eur-Med	M	Crataegus monogyna			2	–			2.5	2
Eura	M	Frangula alnus			2	–			2.5	2
Adv	M—E	Ulmus minor			–	2			2.5	2
Shrub stratum II										
Adv	M	Amorpha fruticosa	5	3	5	2	2	3	5	3.3
Adv	M—E	Vitis riparia	2	3	1	5	4	4	5	3.1
Eur	MM	Fraxinus angustifolia ssp. pannonica	+	2	–	+	2	2	4.2	1.2
Adv	MM	Celtis occidentalis	1	–	2	1	1	+	4.2	1.2
Adv	MM	Morus alba	1	1	–	+	–	2	3.3	1
Eur-Med	M	Crataegus monogyna	–	–	1	–	–	–	0.8	1
Eura	Th	Acer negundo	–	+	–	–	–	–	0.8	+
Eura	M	Frangula alnus	–	–	–	+	–	–	0.8	+
Eur	M—MM	Ulmus minor	–	–	–	+	–	–	0.8	+
Herb stratum										
Med	H (G)	Aristolochia clematitis	4	1	4	3	3	3	5	3
Eur-Med	H (N)	Rubus caesius	3	4	2	3	3	3	5	2.7
Adv	M	Amorpha fruticosa	2	2	1	2	+	1	5	1.3
Adv	M—E	Vitis riparia	2	2	2	2	+	+	5	1.3
Adv	MM	Celtis occidentalis	1	–	2	+	–	+	3.3	0.8
Eura	MM—M	Populus alba	1	1	+	1	–	–	3.3	0.8
Aur	MM	Fraxinus angustifolia ssp. pannonica	–	+	–	+	1	1	3.3	0.5
Eur	MM—M	Ulmus minor	–	–	+	+	1	+	3.3	0.2
Eur-Med	H	Carex distans	–	+	+	–	+	+	3.3	+
Eura	H	Glechoma hederacea	–	+	+	+	–	+	3.3	+
Eur-Med	MM—M	Quercus robur	–	+	+	+	–	+	3.3	+
Cir	G	Equisetum arvense	–	1	–	–	+	+	2.5	0.3
Eura	M	Frangula alnus	–	+	1	–	–	+	2.5	0.3
Eur-Med	M	Crataegus monogyna	–	+	+	–	–	+	2.5	+
Eur-Med	G—HH	Iris pseudacorus	–	+	+	–	+	–	2.5	+
Eur-Med	M	Phyrus achras	1	–	–	+	–	–	.6	+
Eura-Kozm	H	Calystegia sepium	–	+	–	–	+	–	1.6	+
Cir	H	Vicia cracca	–	+	–	–	–	+	1.6	+
Cir	H	Stachys palustris	–	+	–	+	–	–	1.6	+
Eura	H H	Lycopus exaltatus	–	–	+	+	–	–	1.6	+
Adv	MM	Morus alba	+	–	–	–	–	–	0.8	+
Cir	H	Prunella vulgaris	–	–	+	–	–	–	0.8	+
Eura	Th	Setaria viridis	–	+	–	–	–	–	0.8	+
Eur	Ch	Lysimachia nummularia	–	–	+	–	–	–	0.8	+
Cir	H	Galium palustre	–	–	–	–	+	–	0.8	+
Kozm	H	Urtica dioica	–	–	–	–	–	+	0.8	+

From among the floral elements, the Eurasian species dominate. But the number of adventive, circumpolar and Euro-Mediterranean species is also comparatively considerable.

The proportion of phanerophytons and hemikriptophytons is approximately corresponding (Fig. 4).

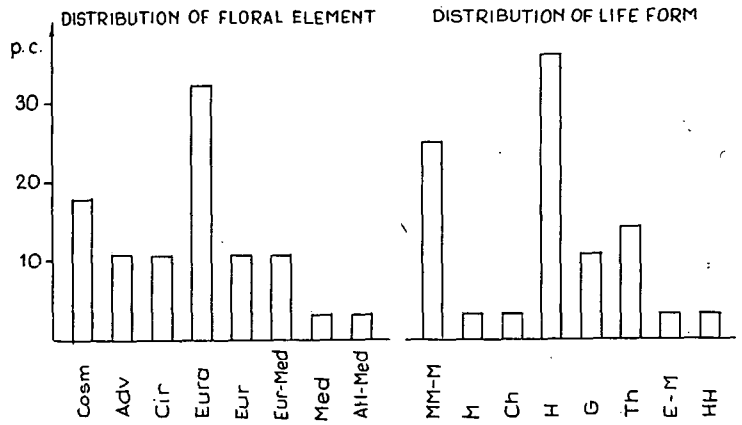


Fig. 4. Distribution of the floral element and life form of *Salicetum albae fragilis* ISSLER 26 (poplar type).

Fraxino pannonicae - Ulmetum pannonicum Soó 63 *(Quercus robur consociation)*

This stand can also be divided into two "types". The tree stratum of one of these is formed by high, slenderly built roburs, their trunk diameter being 40 to 50 cm. In the shrub stratum *Amorpha fruticosa* is "thick as a brush". A herb stratum only develops where the shrub stratum is not closed. The latter is formed here and there by the pure stand of *Equisetum arvense ramulosum.*

In the other type of the oak plantation the tree stratum is similar but below that a well-closed second tree stratum is formed by *Fraxinus angustifolia* and *Ulmus minor.* The shrub stratum and herb stratum are unimportant because of this double tree stratum.

Our coenological survey is shown in Table 3.

As compared with the oak-forests in the northern Great Plain (SIMON 1957), the number of circumpolar elements is high and it is also richer in Euro-Mediterranean and adventive elements. The distribution of life forms also agrees with the oak-forests in the northern Great Plain, only the number of geophytons is somewhat higher (Fig. 4).

The height of stands and the cover of the single strata is contained by Table 4.

Subsoil-water content

From among the stands, the soil of the poplar plantation was the driest. The cause of this is primarily the higher stratum and the loose sandy soil. The soil of the oak plantation is less sandy and its water content forms a transition from poplar to willow plantations (Fig. 6).

Table 3. *Species composition of Fraxino pannonicae – Ulmetum pannonicum* Soó 63

Floralelement	Life form	Species	Surveys 1	2	3	4	K	A—D
Treet stratum								
Eur-Med	MM—M	Quercus robur	5	5	5	5	5	5
Adv	M—E	Vitis riparia	–	1	+	+	3.8	0.3
Shrub stratum I								
Eur	MM	Fraxinus angustifolia ssp. pannonica	–	4	–	4	2.5	MM 4
Eur	MM—M	Ulmus minor	–	3	–	3	2.5	3
Shrub stratum II								
Adv	M—E	Vitis riparia	1	2	+	+	5	0.8
Adv	M	Amorpha fruticosa	5	–	4	5	3.8	4.3
Eur	MM	Fraxinus angustifolia ssp. pannonica	1	4	4	–	3.8	3
Eur	MM—M	Ulmus minor	–	3	+	–	2.5	1.5
Herb stratum								
Eur	MM	Fraxinus angustifolia ssp. pannonica	2	3	2	3	5	2.5
Eur-Med	H (N)	Rubus Caesius	2	3	2	2	5	2.3
Adv	M	Amorpha fruticosa	2	1	2	1	5	1.5
Adv	M—E	Vitis riparia	1	1	2	1	5	1.3
Eur	MM—M	Ulmus minor	+	2	1	1	5	1
Eur-Med	MM—M	Quercus robur	1	+	+	+	5	0.3
Cir	G	Equisetum arvense var. ramulosum	3	1	+	3	3.8	2
Med	H	Aristolochia clematitis	+	2	2	1	5.8	1.3
Eur-Med	H	Carex sp.	1	–	1	+	3 3.8	0.7
Eura	M	Frangula alnus	+	–	+	+	3.8	+
Cir	H	Vicia cracca	+	–	–	+	2.5	+
Cir	Th	Atriplex hastata	+	–	–	+	2.5	+
Kozm	H	Calystegia sepium	–	–	+	+	2.5	+
Eur	H	Symphytum officinale	+	–	–	–	1.3	+
Cir	Th	Erysium cheiranthoides	+	–	–	–	1.3	+
Eura	HH	Lycopus exaltatus	+	–	–	–	1.3	+
Eura	Ch	Solanum dulcamara	+	–	–	–	1.3	+
Atl-Med	G	Leucojum aestivum	–	–	+	–	1.3	+

Table 4

Stand	Herb stratum 1	2	Shrub stratum 1	2	Tree stratum 1	2
Salicetum albae fragilis (willow plantation)	43	0.3	10	4.0	66	11.0
Salicetum albae fragilis (poplar plantation)	55	0.5	60	3.0	58	22.0
Fraxino pannonicae–Ulmetum	40	0.4	73	3.0	58	22.0

1 = cover (percent)
2 = height (m)

Wood mass of the stands (Sopp 1977):

Salicetum albae-fragilis (type of willow plantations)	410 c. m/ha
Salicetum albae-fragilis (type of poplar plantations)	500 c. m/ha
Fraxino pannonicae – Ulmetum pannonicum	600 c., /ha

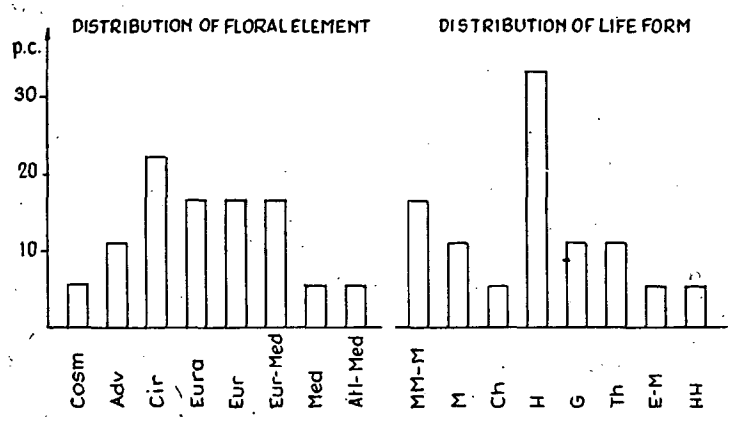


Fig. 5. Distribution of the floral element and life form of *Fraxino pannonicae – Ulmetum pannonicum* Soó 63.

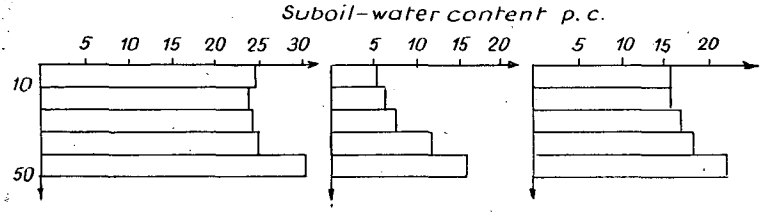


Fig. 6. Water content of the soil of stands:
1 = *Salicetum albae fragilis* Issler 26 (willow type)
2 = *Salicetum albae fragilis* Issler 26 (poplar type)
3 = *Fraxino pannonicae – Ulmetum* Soó 63

Stand climate

On the basis of the investigations into the stand climate on 29 June 1977, the following can be established:

In the open plough-land and in the dead-arm, as well as in the willow-poplar gallery forest, the daily averages of the air temperature, in a height of 190 cm, differ hardly. But in the extreme values of temperature, the difference is considerable. It may be mentioned as an example that while in the plough-land the daily range of thermometer in this height is 20.4 °C in the forest it only is 11.0 °C and in the dead-arm not more than 14.3 °C, either.

In the soil temperature, in the three stands, even the averages differ considerably. The difference is, in 2 cm depth, 24.0 °C, in the forest it is 17.0 °C and in the mud of the dead-arm 17.9 °C. The daily fluctuation is also very different. This is, 2 cm deep, in the open plough-land 16.8 °C, in the forest 2.8 °C and in the mud of the dead-arm it is not more than 1.2 °C. It can be ascertained therefore, that the temperature fluctuations particularly in the soil, are strongly moderated by the dead-arm and the adjacent comparatively narrow forest belt.

In the forest and above the dead-arm, the relative vapour content of the air is about 10 percent higher than in the open plough-land area (78, resp. 68 percent).

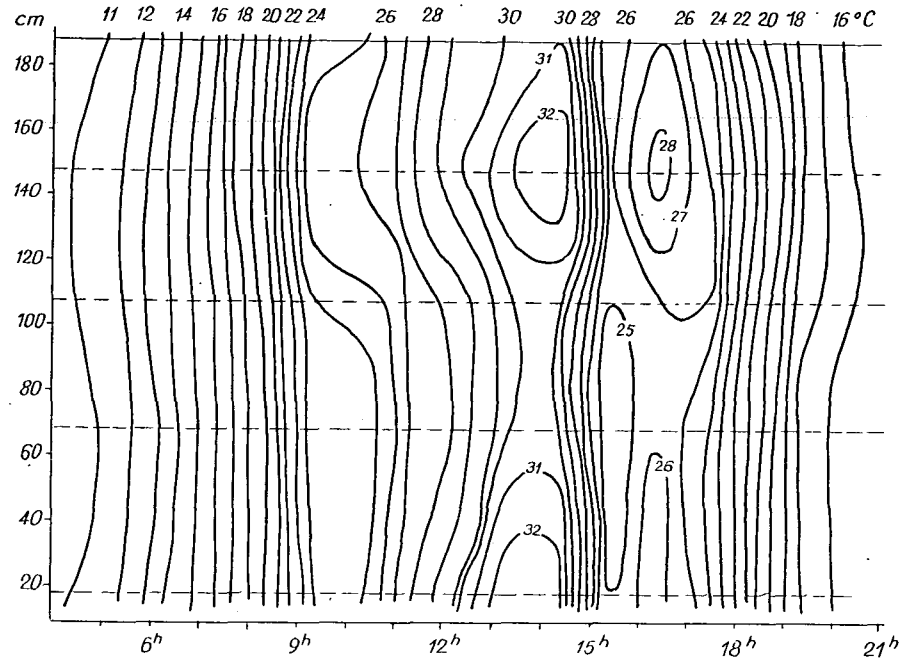


Fig. 7. Air-temperature isoplates of the open plough-land (29 July, 1977).

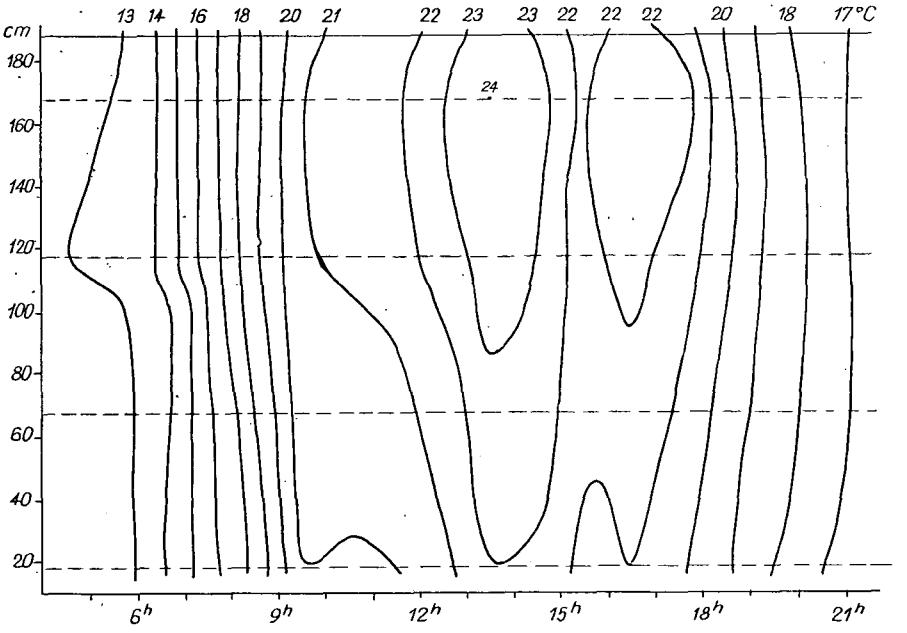


Fig. 8. Air-temperature isoplates of *Salicetum albae fragilis* Issler 26 (willow type) (29 July, 1977).

The daily fluctuation of the relative vapour content is similarly about 10 percent less (40, resp. 51 percent).

From the results of the investigations into the stand climates, the details of the isoplates of air temperature are shown in Fig. 7 to 9.

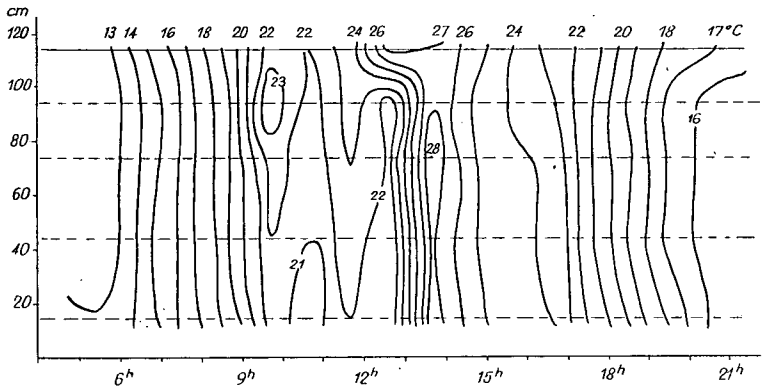


Fig. 9. Air-temperature isoplates of the dead-arm. (29 July, 1977)

Reconstruction of the dead-arm and its evnironment

It can be established on the basis of our investigations that the anthropogenous effect taking place of late decades in the Tisza Dead-Arm at Lakitelep and the adjacent forest fringes is considerable. In spite of this, some autochthonous tree species are revived even today *(Quercus robur, Ulmus minor, Fraxinus angustifolia* ssp. *pannonica, Alnus glutinosa),* and among the plants of soft stalk, *Leucojum aestivum, Arum maculatum, Urtica Kioviensis, Iris pseudacorus* are also to be found. The vegetation of the dead-arm, which is free of the damages by the herbivore fishes, is particularly valuable.

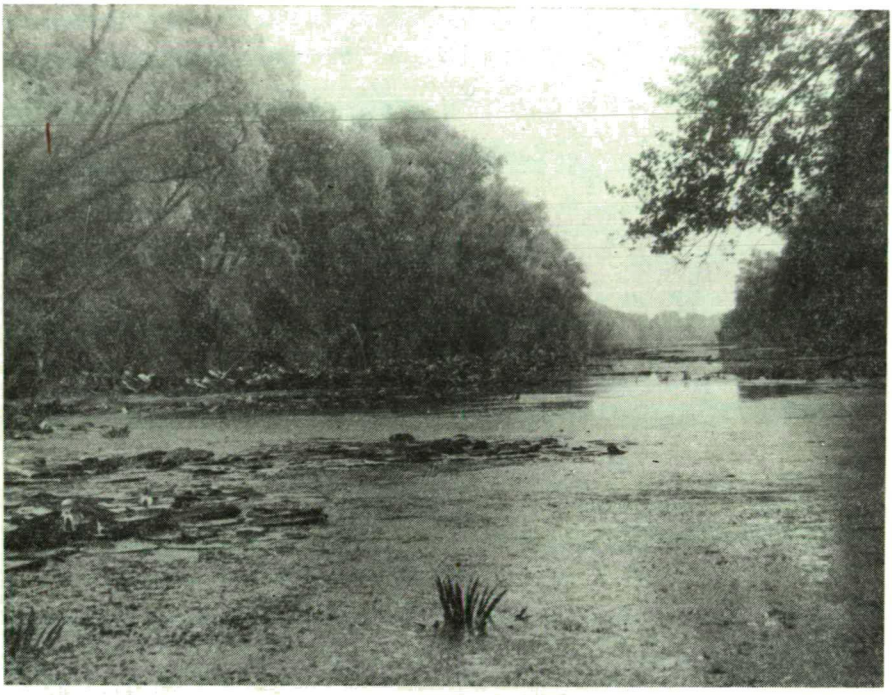
In the shrub stratum the largest change — and, at the same time, the greatest problem — is caused by *Amorpha fruticosa* being present in large numbers.

The microclimate moderating influence of the dead-arm and forest is considerable what is an important abiotic condition of region reconstruction.

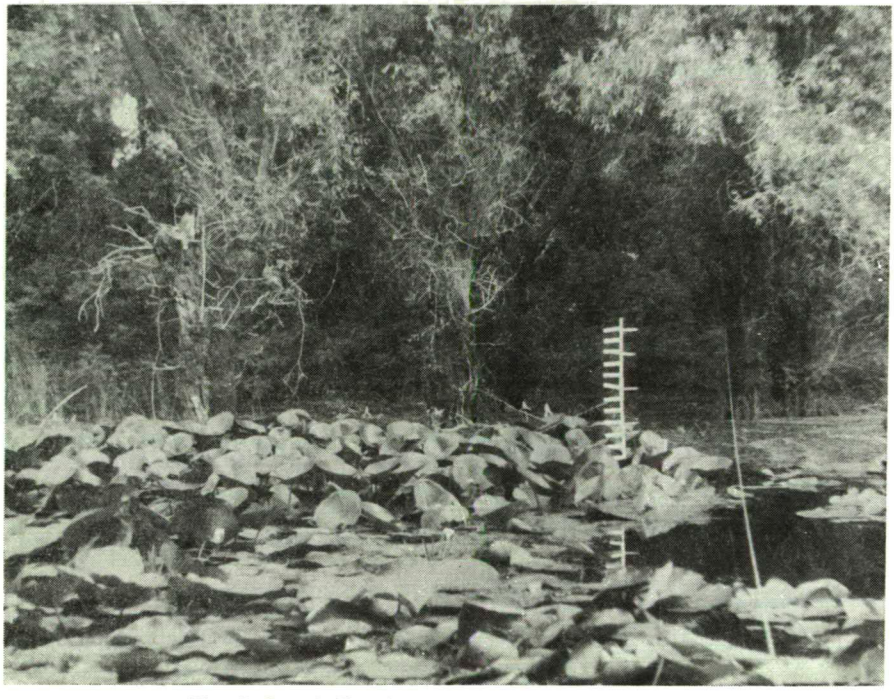
Parallel with our investigations, there took also place water-chemical and algological investigations in the Tisza Dead-Arm at Lakitelek (Szűcs 1978, Kovács 1978). The plans of region reconstruction were elaborated after taking these into consideration. We have departed from that the meandering slow waterflow was characteristic of the lowland stretch of the ancient Tisza before river control. The physical conditions of this must first be ensured then, following this, the animal species, exterminated owing to the anthropogenous influences, ought to be reintroduced.

Two things are necessary to ensure the above conditions:

(a) Owing to the siltation of the river bed,taking place since the river control, rising of the water surface of the dead-arm by 1 to 1.5 m. Dredging of the river bed would also mean some solution but it would be more difficult to put this into practice.



Pict. 1. Tisza Dead-Arm at Lakitelek.

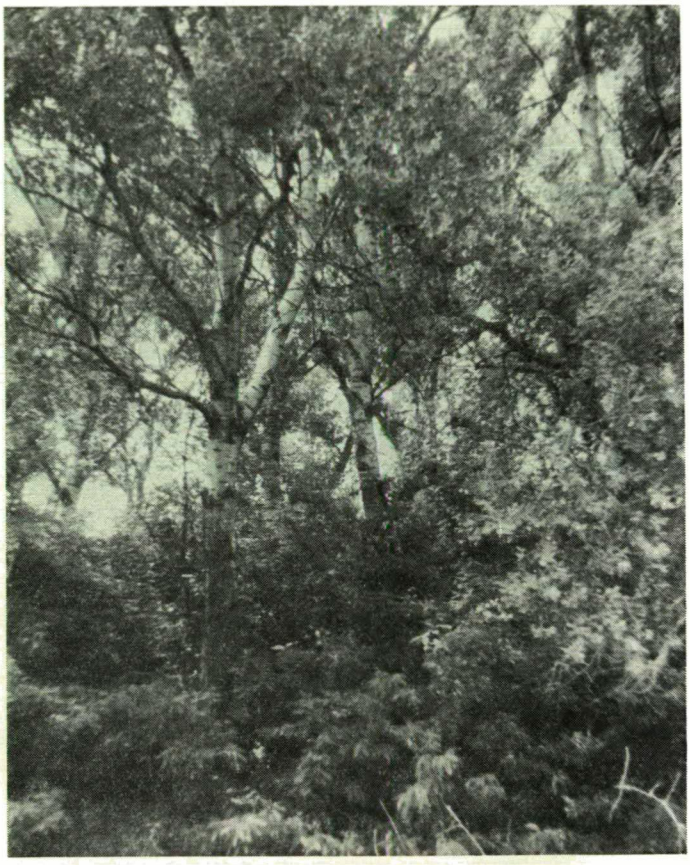


Pict. 2. Stand-climatic investigation in the dead-arm.

Pict. 3. Willow type of *Salicetum albae fragilis* ISSLER 26.

Pict. 4. *Quercus robur* consociation of *Fraxino pannonicae – Ulmetum pannonicum.*

(b) Safeguarding a slow flowing through the dead-arm, in compliance with the water movement, corresponding to the meanders before the river-control. This can be solved by building two sluices and lift stations in a way that the water surface of the dead-arm should always be independent of the water surface of the living Tisza. The detailed biological reconstruction of the dead-arm and its environs can be elaborated and realized after carrying out these precautionary measures.



Pict. 5. Poplar type of *Salicetum albae fragilis* ISSLER 26.

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A lakiteleki Holt-Tisza tájrekonstrukciója Tőserdőn végzett ökológiai vizsgálatok alapján

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Kivonat

Tőserdőn és a lakiteleki Holt-Tiszán végzett növényökológiai vizsgálatok alapján megállapítható, hogy e Tisza-szakasz az antropogén hatások ellenére is alkalmas tájrekonstrukcióra. A Holt-Tisza melletti erdőkben több őshonos fafaj még ma is felújul, és a holtág makrovegetációja is gazdag.

A tájrekonstrukció megvalósításának feltételei:

(a) A szabályzás óta bekövetkezett meder feltöltődés miatt a holtág vízszintjének 1—1,5 m-rel történő megemelése.

(b) A szabályozás előtti meanderekre jellemző vízmozgásnak megfelelően lassú átfolyás biztosítása a holtágon. E fizikai feltételek megteremtése után a vízi- és vízparti társulásokban a jellemző, de antropogén hatások miatt kipusztult növény- és állatfajok visszatelepítése.

Rekonstrukcija predela Mrtve-Tise kod Lakitelek-a na osnovu ekoloških ispitivanja u Tőserdő-u.

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Abstract

Na osnovu ispitivanja u Tőserdő-u i na Mrtvoj-Tisi kod Lakitelek-a moguće je utvrditi da ja područje reke Tise i pored antropogenog uticaja pogodno za rekonstrukciju predela. U šumamo pored Mrtve-Tise još se i danas više autohtonih drvenastih vrsta obnavlja, a takodje je i mrtvadj bogata makrovegetacijom.

Uslovi za realizaciju rekonstrukcije predela:

(a) Podizanje nivoa vode za 1—1,5 m., koje je neophodno usled podizanja dna mrtvaje za vremena regulacije toka reke Tise.

(b) Obezbedjenje sporog protoka vode na mrtvajama, koji je bio karakterističan za meandre pre regulacije toka reke Tise. Nakon obezbedjenja ovih fizičkih uslova naseljavanje za vodenu i priobalsku zonu karakterističnih biljnih i zivotinjskih vrsta, onih koje su pod uticajem antropogenih faktora izumrle.

Восстановление ландшафта реки Холт-Тиса (Мёртвая Тиса) в районе Лакителек на основании проведенных в Тёшэрдё экологических исследований

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Резюме

На основании ботанико-экологических исследований, проведенных в Тёшэрдё и Лакителек, установлено, что, вопреки антропогенным влияниям, эта часть Тисы является пригодной для восстановления ландшафта. В прилегающих к Мёртвой Тисе лесах регенерируются многие древесные сорта-аборигены, макровегетация мёртвого русла также является богатой.

Условия осуществления восстановления ландшафта:

а) поднятие водного уровня в русле на 1—1,5 м из-за обмеления русла, произошедшего со времени регулирования;

б) обеспечение соответствующего медленного протекания через мёртвое русло водного потока, характерного для предшествующих регулированию меандров. После создания этих физических предпосылок — обтарное насаждение или внедрение сортов растений и разновидностей животных, характерных для водных и прибрежных сообществ, вымерших в результате антропологенных влияний.