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LANDSCAPE ECOLOGICAL RESEARCHES IN THE WESTERN MAROSSZÖG (HUNGARY)

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Összefoglalás – A Maroszög részletes élőhely térképezése 2002-ben kezdődött. A munka első lépéseként 2002-ben elkészítettem a vizsgált terület első 1:50.000-es aktuális élőhelytérképét a CORINE-CÉT (CLC-CÉT) élőhelyosztályzó rendszer szerint. A 2004-től induló MÉTA program (Magyarországi Élőhelytérkép Adatbázis) során az élőhelyek természetességét, regenerációs potenciálját, veszélyeztető tényezőit is térképeztük. Emellett a talaj és növényzet kapcsolatának vizsgálata is hangsúlyos szerepet kapott a vizsgálatban. A vizsgálati terület 4 részre különül el élőhely-kompozíció alapján. Ezek a Tisza-Maros-szöge, a Torontál, a Maros és a Tisza Maros-torok körüli szakasza, valamint a Maros felsőbb (magyarországi) szakasza (Landori-erdő Nagylak közöt). A felszíni üledékek, a talajok, a másodlagos szikesedés hatása, a folyók dinamikája és a tájhasználat hatása az élőhelyekben visszatükröződik. Az élőhely-kompozíciók természetessége és az ökorégiók kvantitatív növényföldrajzi analízise alapján a táj agrár-urbánus táj, sok természet közeli, értékes élőhellyel, amelyek regenerációs potenciálja jónak mondható.

Summary - The detailed landscape biotope-mapping of Marosszög (Marosangle) has begun in 2002. As the first step of this work I made the first 1:50,000 actual vegetation map of the study area in 2002 on the basis of the CORINE-CÉT (CLC-CÉT) habitat classifying system. The naturalness, the regeneration potential, the risk factors were also mapped during the Hungarian Biotope-Map Database (MÉTA) programme started in 2004. Besides these factors the study of the connection between soil and vegetation played an important role in the research. The research area has 4 characteristical parts according to the biotope composition which are the Tisza-Maros szöge (Tisza-Maros-angle), Torontál, Lower Maros and Tisza river section around the mouth, and the upper Hungarian Maros river section between Landori-forest and Nagylak. The effects of the surface sediments, soils, secondary salinization, flood dynamics and land use are summarized in the habitat-types. The naturalness of the biotope-compositions and the quantitative plant geographical analysis of the ecoregions show that this is an agricultural-urban landscape with a lot of near-natural valuable biotopes with good regeneration potential.

Key words: landscape ecology, biotope mapping, connection between soil and vegetation, flood-area and alcali sodic habitats, naturalness, regeneration potential, ecoregion

INTRODUCTION

The study area is situated in the Southern Tiszántúl of Hungary between the settlements Szeged-Makó-Hódmezővásárhely. Dominantly it is part of the Marosszög microregion, but the most nothern part of the study area is streching into the South Tisza Valley microregion. Both belong to the Lower Tisza Region (*Marosi and Somogyi*, 1990). The area is covered by alluvial sediments. The common geomorphological features of this landscape are the abandoned early Holocene riverbeds and belt-banks of river Maros and Tisza which enclose flood-free loess-silt areas, but only in Torontal and alongside the eastern border of Maroszug.

Marosszög is bordered in the northeast by the Pleistocene loess-land of the Csongrádian Plain (Hódmezővásárhely-Batida-Makó-Nagylak-lane). This curvy borderline fits to the 80 m elevation contour line. The western border of this region is the South-Tisza-valley. This landscape continues towards Serbia-Montenegro and Romania. The Marosszög connects to the Lower Maros Valley at Nagylak and Sejtény in the southeast. The southern border of Marosszög could be the line of Krstur (Ókeresztúr) – Banatsko Aranđelevo (Oroszlámos) – Beba Veche (Óbéba) – Cenad (Nagycsanád).

Soil geographical studies on the Szegedian part of this study area were published by *Keveiné Bárány* (1988), who used the categories of Géczy. *Takács* (1989) presented a genetic soil map of Csongrád County according to the TIM code system (Information System of Protection and Monitoring of Soils, RISSAC).

A transboundary comparing work studied the river Maros in 1991, which collected soil, hydrological, floristic (vascular plants, phytoplancton) and faunistic (zooplankton, shells, arthropoda, fishes, birds) data (*Sárkány-Kiss et al.*, 1997). The former and recent geographical and biological researches of the Maros valley between Szeged and Makó were reviewed by *Gaskó* (1999). This work describes the history of the landscape and the geographical names; it also presents microclimatical examinations, vegetation, protected plants, the condition of the forests and zoological researches (Cerambycida, Coleoptera, fish, amphibia, reptiles, birds and mammals).

The examined landscapes belong to the Crisicum flora district of the Eupannonicum flora area which is part of the Pannonicum flora province (*Marosi and Somogyi*, 1990). The few coenological maps made of this region only have historical value, as the landscape has changed since then. Maps were made at the mouth of the Maros (*Bodrogközy*, 1971), and at the Beach and Nagylegelő (Great Pasture) of Makó (*Tóth*, 1967). In 2002 I created a 1:50,000 digital CLC-CÉT biotope map for the area situated between Szeged, Makó and Hódmezővásárhely. In 2004 the researches became more intensive and covered almost the whole Southeastern Csongrád County.

METHODS

The genetic soil maps of TIM- (*Takács*, 1989) and Géczy's system were suitable to examine the connections between soil and vegetation (*Keveiné Bárány*, 1988).

The vegetation was classified according to the CORINE-based systems (CORINE biotope map (CÉT) (*Molnár*, 2000), CORINE Land Cover (CLC) (CLC50) (*FÖMI*, 2000)) biotope category-systems are used for biotope maping. The use of both the CLC and CÉT is required, because the CLC is too general for natural or semi-natural habitats but the CÉT includes categories only for natural and semi-natural biotopes. On the presented map some categories (mainly urban and agricultural biotopes) are integrated *(Fig. 1)*.

The base maps of the biotope maps are the 1:25,000 and 1:50,000 Gauss-Krüger topographical maps (*MH*, 1992). The State Forestry Service's forest management plans (*ÁESZ*, 1998a) and maps (*ÁESZ*, 1998b) helped to identify the forest biotopes. All the information of the different maps is digitised with ArcView GIS 3.2. with the help of SPOT-4 satellite images (*CNES*, 1998). I used the naturalness and the ecoregion of biotopes for quantitative analysis. The naturalness was classified according to Németh-Seregélyes on a scale of 1 to 5 (*Molnár*, 2003). The naturalness and the regeneration potential can be integrated in one concept called ecoregion (5-level scale) (*Bölöni et al.*, 2003; *Molnár*, 2003). The Habitat Guide (*Bölöni et al.*, 2003) contains definitions and describes the naturalness and regeneration potential for each biotope.

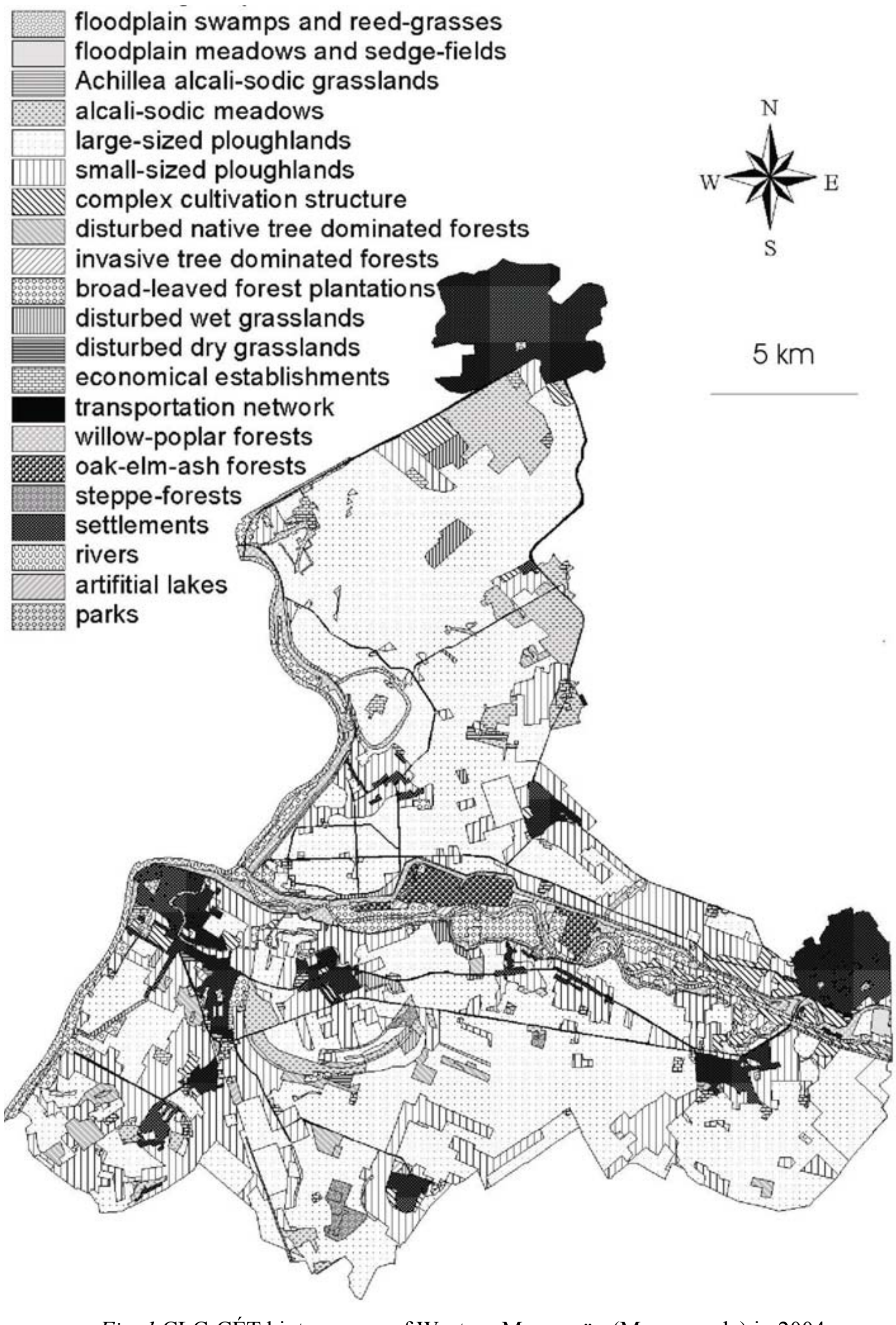

Fig. 1 CLC-CÉT biotope map of Western Marosszög (Maros-angle) in 2004

RESULTS AND DISCUSSION

Floodplain region between the Landori-forest and Makó (Upper Maros Section)

The soil of the area between the dykes is soil deposit (according to Géczy's classification or humic meadow alluvial soil (according to TIM). The floods appear here regulary. Their duration and height influence the vegetation. In these areas the biotope diversity is higher than the genetical soil diversity *(Table 1)*. The biotope diversity grows further because of the land use (e.g. on the place of the willow-poplar forests flood-areal meadows can be formed in case of mowing or grazing).

The Upper Maros Section has higher habitat diversity. This part is a mixture of traditional floodplain agricultural, natural and semi-natural floodplain habitats. The natural and semi-natural biotope components are the reeds, the floodplain meadows, the willow-poplar forests, the oak-elm-ash forests and the sand bank vegetation. The reason of higher biodiversity could be the greater role of natural landscape formation as it is a border area between Hungary and Romania. Intensive land use was not so common here.

The changing of the riverbed is quite intensive in this section. The formation of islands and sandbanks is very typical, especially between Apátfalva and Nagylak. I discovered 2 new islands between Ferencszállás and Kiszombor. The succession of these islands is very fast. Within a few years the Nanocyperion community changes into a Salix alba-dominated gallery forest. The Salix-shrubs are not long-lasting.

The river Maros and its dykes accompanied by willow-poplar forests with good naturalness. The riverside patches are in better condition. Some of them are old; the majority of them are middle-aged. Unfortunately, invasive species attacked them: Amorpha fruticosa, Fraxinus pennsylvanica are the most frequent, but Acer negundo, Vitis riparia, Echinocystis lobata, Xanthium italicum also appears. However, they are not as common as in the Tisza-valley.

Oak-elm-ash forests are quite rare and can be only seen at Makó. Their naturalness is rather medium. Some of these forests are transitions towards willow-poplar forests. This forest type is almost extinct in the Great Hungarian Plain, and it is much rarer alongside the river Tisza. The patches at Makó are threatened by being built in.

Table 1 Connection between soil and vegetation in the floodplain between the dykes in Western Marosszög

Soils		**Vegetation**	
Genetical map (TIM-code)	**Géczy's map (*Keveiné Bárány*, 1988)**	**mm-ÁNÉR (GNHS)**	**CORINE Biotope map (CÉT)**
- humic meadow alluvial soil (39/5)	- soil deposit	A1. reed-grass of eutrophic standing waters B1A. non-peaty reeds, bulrushes, rushes D34. meadows J4. willow-poplar floodplain forests J6. Hard-wooden floodplain forests	115. Open water-surface with reed-grass 111. floodplain swamps 121. floodplain meadows and sedgefields 212. willow-poplar forests 224. hard-wooden oak-(elm-ash) forests

Floodplain meadows can be found almost only in this upper river section. These meadows were pastures and hay-fields earlier, but they are not always used the way like in the past as the number of the farm animals is decreasing. Their naturalness is between medium and good.

The agricultural biotopes consist of very small and diverse mosaics of small-field ploughlands, abandoned, extensively used floodplain orchards, week-end gardens, old and young fallows. There are cultivated poplar-forests too, which contain a lot of invasive Amorpha fruticosa. These forests should be replaced by native poplar and willow species.

The abandoned, extensive small-sized orchards are rich in local cultivated species (plum, apple, pear, cherry, sour cherry, nut, apricot and peach). They are planted mixedly so within one little plot 20-30 different kinds of fruit species can be found. These orchards are cultural and agricultural heritage too. The big flood of 1970 destroyed the majority of them. Since then they are getting abandoned and attacked by invasive species (Vitis riparia, Fraxinus pennsylvanica, Amorpha fruticosa).

Besides the orchards a lot of ploughlands are abandoned. As these fallows are not grazed or mown they (now weedy wet grasslands) are getting filled with invasive species (Xanthium italicum, Amorpha fruticosa, Fraxinus pennsylvanica) soon and their regeneration towards floodplain meadows stops.

Floodplain between Szeged and the Landori-forest of Makó

The lower section of the river Maros and the Tisza river section between Algyő and Szeged differ in several aspects.

Forests are the most common biotopes of this river section. It is here that the naturalness of the forests alongside the Hungarian section. In Vetyehát and in the Landori-forest of Makó oak-elm-ash forests and willow-poplar forests can be found with mainly good or medium naturalness. The invasive species (Fraxinus pennsylvanica, Acer negundo, Amorpha fruticosa) are present too. The regeneration potential of these forests is medium even in the case of the oak-elm-ash forests. The main tree species (Quercus robur, Ulmus minor, Fraxinus angustifolia ssp. pannonica) are regenerating even in the willow-poplar forests, which indicate drying-out processes probably due to the deepening river-bed.

The more natural forests are situated alongside the dykes and river-banks while the area between them is filled with cultivated poplar plantations (e.g. Hajdovai-forest at Klárafalva).

The floodplain meadows, ploughlands and the orchards are almost absent. Many of them were substituted with cultivated poplar forests especially during the 1960s and 1970s, but this process still continous.

The rare oxbow lakes have ruderal plant communities (at Vetyehát) or Bolboschoenus maritimus dominated non-sodic swamp associations in their litoral zone (at Ferencszállás). Island formation is very rare.

Alongside the river Maros sand-mining is a risk factor for the natural forests. In the dried-out mines willow-poplar forests could regenerate (see at Makó), but nowadays these areas are partly built in with weekend houses.

The Torontalian landscape

The southern part of the study area is named Torontál. It is the lowest-lying region of Hungary (the lowest pont is at Tiszasziget (76 m)).

Several settlements (Serbian, Hungarian, German) were established here after the destruction of the medieval settlement system during the Turkish times: Szőreg (now part of Szeged), Újszentiván (Novi Sentivan), Tiszasziget, Deszk (Deska), Kübekháza (Kubekhausen), Klárafalva, Ferencszállás, Kiszombor.

The middle (core) part of Torontál (Szőreg-Kübekháza-Tiszasziget triangle) where pleistocene loess, infusional-loess and loess-silt deposits are dominant is covered by solonetzic meadow chernozem soils. Approaching the rivers firstly carbonated alluvial meadow soil then humic meadow alluvial soil appears on the belt-banks. The deepest parts, the abandoned former river-beds are covered by callous solonetz soil and solonetzic meadow soils (TIM-system, *Takács*, 1989).

Géczy's map shows similar distribution. The areas covered with solonetzic meadow chernozem soil are indicated to have chernozem soil on loess or alluvium, which are gradually replaced by meadow soil and soil deposit towards the rivers of Tisza and Maros. The solonetzic meadow soil areas are named in this system meadow soil with alcali subsoil of alluvial origin, the callous solonetz patches are identified as cultivated alcali soil areas (*Keveiné Bárány*, 1988).

As this area has good-quality soils, all the old forests were cut down and many of the grasslands were ploughed up. Now the landscape is dominated by ploughlands.

The vegetation of the solonetzic meadow chernozem soil, the humic meadow alluvial soil and the less productive solonetzic meadow soil mostly disappeared. The vegetation of the carbonated alluvial meadow soil remained only in the inland water-covered former riverbeds. The vegetation of the callous solonetz areas survived the human impact better.

Table 2 Connection between geomorphology, soil and vegetation in Torontál

Geomorpho-logy	**Soils**		**Vegetation**	
	Genetical map (TIM-code)	**Géczy's map (*Keveiné Bárány*, 1988)**	**mm-ÁNÉR (GNHS)**	**CORINE Biotope map (CÉT)**
pleistocen loess, infusional-loess and loess-silt covered elevations	- solonetzic meadow chernozem soil (20/5)	chernozem soil on alluvium	F3. Aster (Aster punctatus)-Hog's fennel (Peucedanum officinale) – meadow-steppe M3 Alcali-sodic oak-forests	132. Alcali-sodic meadows 245. Steppe-forests
		chernozem soil on loess	H5A. steppe-grasslands on bound soils M2 Loessy oak-forests	144. steppe-grasslands 245. Steppe-forests
Belt-banks of the former flood-area	- humic meadow alluvial soil (39/5)	-soil deposit	F2. Alcali-sodic meadows (few alcali-sodic species) F3. Aster (Aster punctatus)-Hog's fennel (Peucedanum officinale) – meadow-steppe L5. Closed Pendunculate Oak (Quercus robur) forests (just potencial!)	132. Alcali-sodic meadows (few alcali-sodic species) 224. Hard-wooden oak- forests (just potential!)
	- carbonated alluvial meadow soil (31/1)	- meadow soil		
Abandoned river-beds of the former flood area	- callous solonetz soil (24/1)	-cultivated alcali soil	F2. Alcali-sodic meadows F4. Puccinellia alcali-sodic capes M3 Alcali-sodic oak-forests	132. Alcali-sodic meadows 245. Steppe-forests
	- solonetzic meadow soil (29/1)	- meadow soil with alkali subsoil of alluvial origin		
	- carbonated alluvial meadow soil (31/1)	- meadow soil		

The connection between geomorphology, soil and vegetation is shown in *Table 2*. Interestingly the grasslands and forests of the solonetzic meadow chernozem soils are separated according to the material of the subsoil, so Géczy's map explains the vegetational pattern better. The chernozem soil on loess has loess-steppe-grassland whereas the chernozem soil on alluvium has Aster punctatus-Peucedanum officinale (Aster-Hog's fennel) meadow-steppe vegetation. The forest vegetation may have been loessy oak-forest on chernozem soil on loess whereas alcali-sodic oak-forest on chernozem soil on alluvium.

The belt-bank–abandoned riverbed geomorphological complex has great soil diversity, but the biotopes don't always show that diversity. Both geomorphological forms are dominated by alcali-sodic meadows. On belt-banks meadow-steppe, in former river-beds Puccinellia alcali-sodic capes could appear too, but they are not frequent. More occurrences of Aster punctatus-meadow-steppe were observed in the surroundings of Ferencszállás (the edge of the road nr. 43 between Ferencszállás and Kiszombor, alongside the Szeged-Mezőhegyes railway).

The loess-steppe-grasslands are very rare; they can be found mainly at the frontier of Serbia-Montenegro-Hungary, Romania-Hungary with good naturalness.

In Torontál the Quercus robur – the original dominant tree of this land – was planted in higher proportion. The regeneration of the open alcali-sodic oak-forest and loess-steppe oak-forest can be observed at Tálagyi-forest or at Ferencszállás. The more natural forests are planted on former grasslands.

The alcali-sodic meadows are partly secondary ones and could form after the regulation of the riverways. The dominant grass is Alopecurus pratensis. Agrostis stalonifera is absent (this species is typical in this biotope in the alcali-sodic depressions of the loess-lands outside the floodplains of the Tiszántúl). Alcali sodic species indicate that this is now alcali-sodic grassland: interestingly, Limonium gmellini is not so common, but Cerastium dubium, Trifolium angulatum, Ranunculus pedatus, Podospermum canum are frequent. Little Achillea alcali-sodic grassland patches can be observed on the dried-out meadows.

Big alcali-sodic meadows are in Tataribara and Fertály in Tiszasziget and in the Szőregian-Deszkian-pasture. The Szőregian-Deszkian-pasture is the biggest grassland of Torontál and it's now a NATURA 2000 (SAC) site. In the middle of it little Artemisia alcali-sodic grassland patches appear, the only representatives of this habitat in Torontál. Unfortunately the eastern half of the pasture was ploughed up after the compensation. This is the most common risk factor at these habitats.

The Tisza-Maros-szöge (Tisza-Maros-angle) region

The triangle-shaped Tisza-Maros-szöge was a huge floodplain swamp with floodplain meadows on their belt-banks according to the 1st military survey (*HMT*, 1764-1787; *Deák*, 2004). After the regulation of the riverways the swamps dried out into floodplain meadows (*HMT*, 1806-1869). Swamps remained only in the deepest parts, but during the 20th century they were drained. The only swamps and reed-grass biotopes were preserved in the Oxbow lake of Nagyfa. During the last 100 years the majority of the meadows were ploughed up (*HMT*, 1872-1887), but the area became secondarily salinic. On the most salinic eastern edge of this landscape a chain of alcali-sodic meadows exists. These are the Nagysziget of Hódmezővásárhely and the 4 remaining patches of the Batida-puszta (previously it may have been one grassland).

Presently the Tisza-Maros-szöge is dominated by large-sized ploughlands. The area of the small-sized ploughlands hasn't grown much after the compensation. The area of forest plantations is very limited and they are dominated by non-native species. Just 2 bigger pendunculate oak (Quercus robur) plantations occur on grasslands at Batida, which are regenerating slowly towards alcali-sodic oak-forest. The channels preserve the former vegetation of floodplains.

The major nature conservation values of these landscapes are the alcali-sodic grasslands. They differ in several aspects from the alcali-sodic grasslands of Torontál and the Csongrádian Plain. Their biotope-composition is dominated by alcali-sodic meadows and Achillea alcali-sodic grasslands. Their genetical soil-type differs somewhat from the Torontálian ones too *(Table 3)*.

Table 3 Connection between geomorphology, soil and vegetation in Tisza-Maros-szöge

Geolmorphology	**Soils**		**Vegetation**	
	Genetical map (TIM-code)	**Géczy's map (*Keveiné Bárány*, 1988)**	**mm-ÁNÉR (GNHS)**	**CORINE Biotope map (CÉT)**
Higher elevation belt-banks of the former flood-area	- strongly solonetzic meadow soil (29/2)	-conditionally cultivated alcali soils	F1b. Achillea alcali-sodic grasslands M3. Alcali-sodic oak-forests	131. Achillea-Artemisia alcali-sodic grasslands 245. Steppe-forests
Lower elevation belt-banks of the former flood-area	- carbonated alluvial meadow soil (31/1)	- meadow soil of alluvial origin	F1b. Achillea alcali-sodic grasslands F2. Alcali-sodic meadows (few alcali-sodic species) M3. Alcali-sodic oak-forests	131. Achillea-Artemisia alcali-sodic grasslands 132. Alcali-sodic meadows (few alcali-sodic species) 245. Steppe-forests
Abandoned riverbeds of the former flood area	- callous solonetz soil (24/1)	-cultivated alcali soil	F2. Alcali-sodic meadows M3. Alcali-sodic oak-forests	132. Alcali-sodic meadows 245. Steppe-forests
	- carbonated alluvial meadow soil (31/1)	- meadow soil of alluvial origin		

These alcali-sodic grasslands mirror the geomorphological forms: the abandoned riverbeds are dominated by alcali-sodic meadows and have callous solonetz soils or carbonated alluvial meadow soils (according to TIM). The earlier can be fit with the cultivated alcali soil whereas the latter with the meadow soil of alluvial origin in Géczy's system.

The low elevation elder belt-banks are covered with the mixture of two biotopes: mainly the alcali-sodic meadow forms matrix and the Achillea alcali-sodic grasslands appear as „small islands" in it. Their soil is usually the carbonated alluvial meadow soil (TIM) (meadow soil of alluvial origin at Géczy). On callous meadow solonetz (24/1), mid meadow solonetz (24/2), deep meadow solonetz (24/3) (*Becker*, 1991) at Nagysziget a similar biotope-combination can also be observed.

The higher elevation belt-banks have strongly solonetzic meadow soil (TIM) (conditionally cultivated alcali soil at Géczy) with Achillea alcali-sodic grasslands.

These alcali-sodic meadows are dominated by Alopecurus pratensis (Agrostis stalonifera is absent) too.

Only one secondary regenerating meadow-steppe was found at Gorzsa on a fallow, so this biotope is not typical for this landscape either. The Puccineleia alcali-sodic cape and blind alcali-sodic vegetation appears just as the result of human activity (treading) like at the former military area of Nagysziget, Hódmezővásárhely. No mappable patch of Artemisia alcali-sodic grasslands was observed.

Quantitative plant geographical analysis

Fig. 2 shows the areal percentage of the biotopes. The whole mapped 503.115 km^2 study area is basically an agricultural-urban landscape.

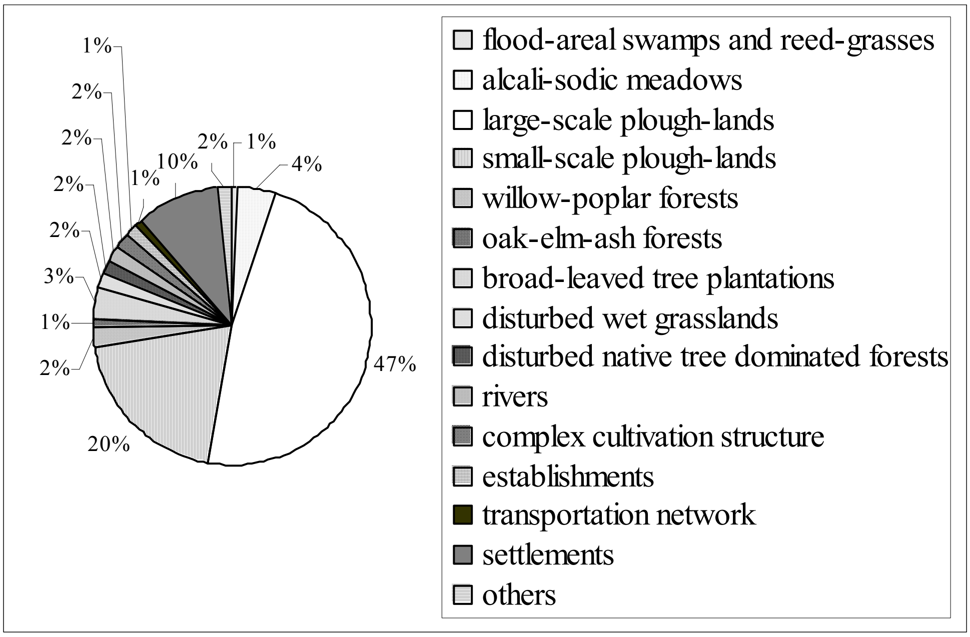

Fig. 2 Ratio of the present biotopes in the study area

67% of the area is ploughland, 10% is settlement. The biggest natural vegetation types are the alcali-sodic meadows (4%, 21.882 km^2). The rivers (7.992 km^2) and the willow-poplar (12.11 km^2) forests represent 2%, whereas the oak-elm-ash forests (5.799 km^2) and flood-areal swamps and reed-grasses (3.237 km^2) just 1% even though that they are typical parts of the riverside natural vegetion. The percentage of the broad-leaved forest plantations (17.532 km^2) which include non-native tree dominated forests is the same as the natural floodplain forests (3%). The disturbed native tree dominated forests (planted oak and native poplar forests outside the area protected by the dykes) represent 2% which is welcome (7.597 km^2).

The map of the naturalness of Western Marosszög (Marosangle) is shown in *Fig. 3*, the percentage of the naturalness of the biotopes is presented in *Fig. 4*. The majority of the study area has bad naturalness (85%, 429.357 km^2 (1) - urban and agricultural areas, non-native tree dominated forests are included here), but the 2[nd] biggest group is the category of biotopes with good naturalness (7%, 33.348 km^2 (4)). This category covers the majority of the willow-poplar forests and alcali-sodic meadows. 2% is given to medium-weak (8.773 km^2), good-medium (8.290 km^2) and excellent-good (9.827 km^2) transitional categories. Excellent-good is the Szőregian-pasture, the mid part of Batida-puszta and the riverbed of Maros. Good-medium category covers mainly the oak-elm-ash forests and some willow-poplar forests. Medium-weaks are the native tree dominated slowly regenerating planted forests, and some old fallows regenerating towards alcali-sodic meadow.

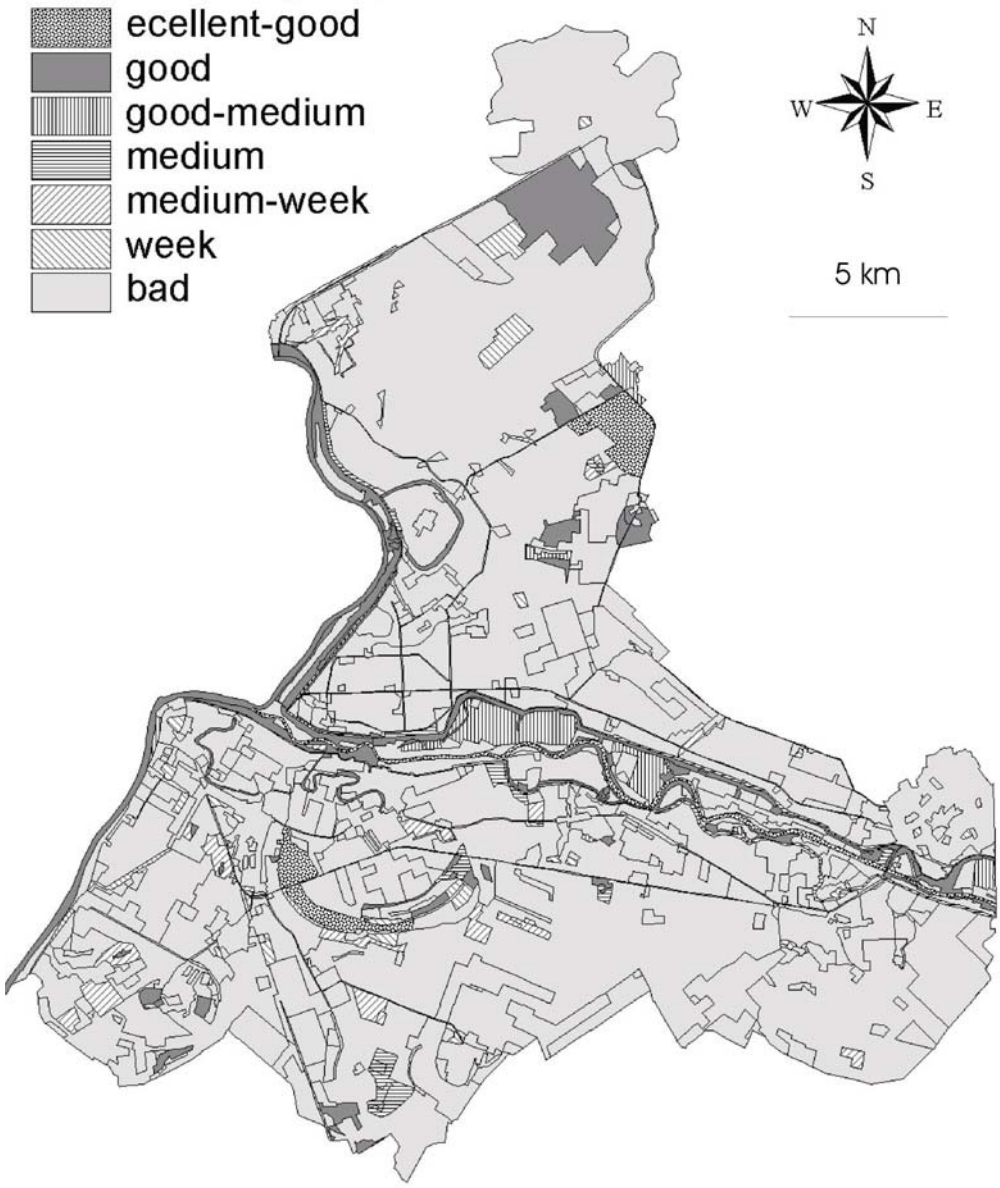

Fig. 3 Map of the naturalness of Western Marosszög (Maros-angle) in 2004

The percentages of the biotopes in the ecoregion are shown in *Fig. 5*, their map is presented in *Fig. 6*. The ecoregional classification helps landscape planning, provides spatial qualitative and quantitative data for environmentally friendly rural development and nature conservation management.

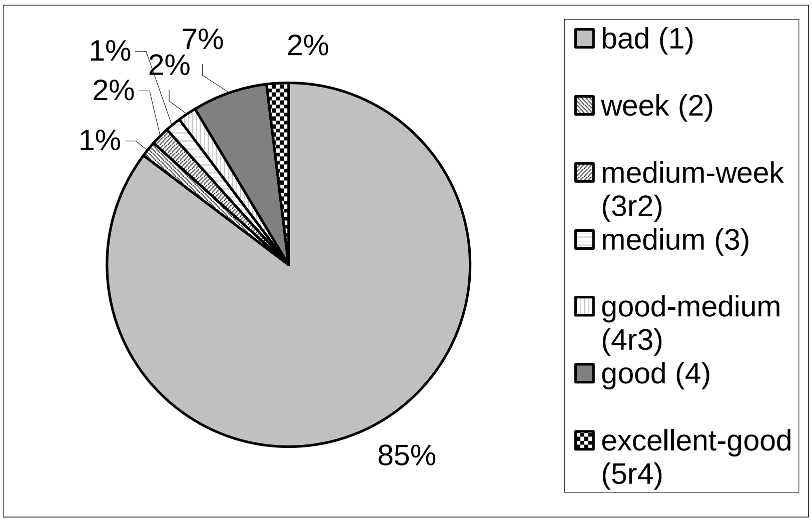

Fig. 4 Naturalness of the study area

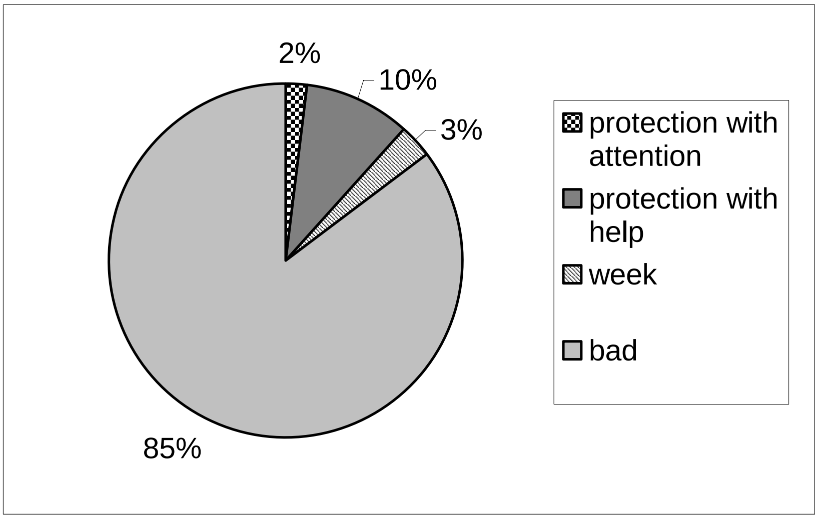

Fig. 5 Ecoregions of the study area

85% of the biotopes have bad ecoregion value (429.357 km^2: urban and agricultural areas, non-native tree dominated forests). 10% (49.155 km^2) of the area requires protection with help which means their naturalness is good or medium, and their regeneration potential is good too. Willow-poplar forests, oak-elm-ash forests, alcali-sodic meadows, Achillea alcali-sodic grasslands, regenerating disturbed grasslands (fallows on alcali-sodic or alluvial deposit), flood areal meadows and regenerating near-natural penduculate oak plantations on alcali-sodic soils can be mentioned at this group. In these biotopes the good naturalness can be held on or achieved with adequate nature conservation management.

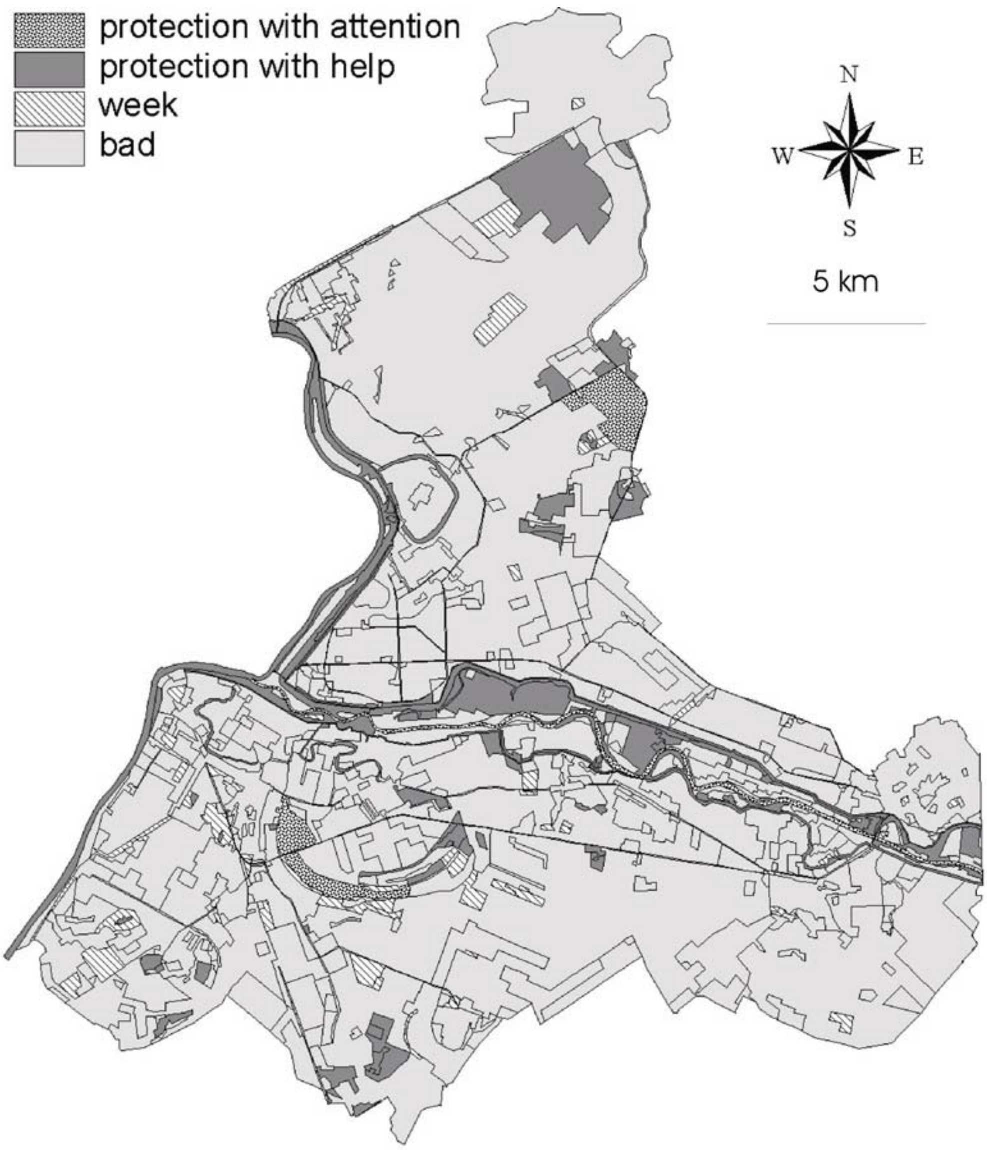

Fig. 6 Ecoregional map of Western Marosszög (Maros-angle) in 2004

Protection with attention (naturalness good-medium, regeneration potential is good) category is 2 % (9.827 km^2). The management of these areas requires special attention, as their quality is the best among the other patches; intensive human land use could destroy them.

3% (14.774 km^2) of the study area has low ecoregion value. Their naturalness is weak or medium-weak too, the regeneration processes are slow. Nature conservation management is only efficient in the long term, but the results are quite questionable. Some fallows and the slowly regenerating native tree dominated forests belong here.

CONCLUSIONS

These mapping works are good for nature conservation to get a full picture of the present conditions of the landscape. They can be a database for the monitoring and planning the landscape and are good for purposes of rural development, forest and water management. They show the regional potential of rural ecotourism and help environmental education. They help the scientific experts, the policy-makers and land-users to make optimal decisions and establish a really sustainable land use.

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