HABITAT CHANGES OF AN ALKALINE LAKE, SOUTH HUNGARY

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ABSTRACT

In this paper a case study of a shallow alkaline lake located on the edge of the Danube-Tisza Interfluve is presented. Alkaline lakes are protected by the Act on Nature Conservation (No. LIII of 1996) in Hungary. Due to the anthropogenic activities (channelization) and the consequences of climate change (decreasing precipitation), the alteration of natural habitats of the sample area was identified. Soil investigations and vegetation mapping were made in order to demonstrate the noticeable changes and to supply data about the current conditions for further monitoring and management activities. The revealed degradation processes are relatively rapid and need urgent proper water-management.

INTRODUCTION

Alkaline lakes as wetlands with opened water-surface have an important role in preserving biodiversity. They are declared "ex lege" protected by the Act on Nature Conservation in 1996 in Hungary, since this type of wetland once so typical of the Carpathian Basin has drastically declined (Molnár 1996, Hoyk 2005, Bíró et al. 2007, Kovács 2009, Simon 2010). The special attention and protection are necessitated by their sensitivity and endangered status as well as the high number of protected and rare species they hold (Boros 2003). These natural lakes with high salt-content are characterized by significant water-level fluctuation. In the driest season lakebeds can completely dry out and the highly concentrated salt precipitates on the surface in the form of crystals. The accumulated salt on the surface was swept up and collected by local people and used for washing. Many of the plants are halophytes-plants that tolerate or even demand significant salt concentrations.

Several factors has contributed to the decline of wetlands (inc. shallow saline lakes) in the Danube-Tisza Interfluve including natural threats such as the declining amount of precipitation due to climate change, and anthropogenic factors like drainage, landuse changes, river regulations, channelization, overexploitation of water resources etc. in the last decades. In this study, the alterations of an alkaline lake located on the edge of the Danube-Tisza Interfluve is investigated (Fig. 1.).

MATERIALS and METHODS

The sample area called Lake Kancsal was formed in a deflation hollow by the support of local and regional groundwaterwater-flow determined by high total salt content. The lakebed is around 16 hectare which has been water-covered till summer still in the 1970s. The lake was used for recreation and fishing purposes. The crossing channel was excavated in 1972. Soil attributes were measured at one sample point in the lakebed in 1949 (Kreybig 1949), and a short description of the vegetation was presented in 2007 about the lake (Tölgyesi – Ladányi 2007). A comparative study of our workgroup published its condition in 2009 among several wetlands in the Danube-Tisza Interfluve (Barna et al. 2011).

In order to describe the actual condition of the lake in 2011, habitat-mapping was made based on the categories of the General National Habitat Classification System (Bölöni et al. 2007) and the changes of the habitat-pattern were researched between 2002 and 2011. The species composition of habitats was also investigated. In case of the main habitat-types along a section, five soil parameters were measured based on the valid Hungarian standards (total salt content, alkalinity, calcium-content, phenolphthalein alkalinity /MSZ-08-0206-2:1978/, humus content / MSZ-21470-52:1983/). By their detailed evaluation, the ongoing processes are aimed to be identified. During the data processing, ArcGis 9.3, Microsoft Excel and CorelDraw X3 were applied.

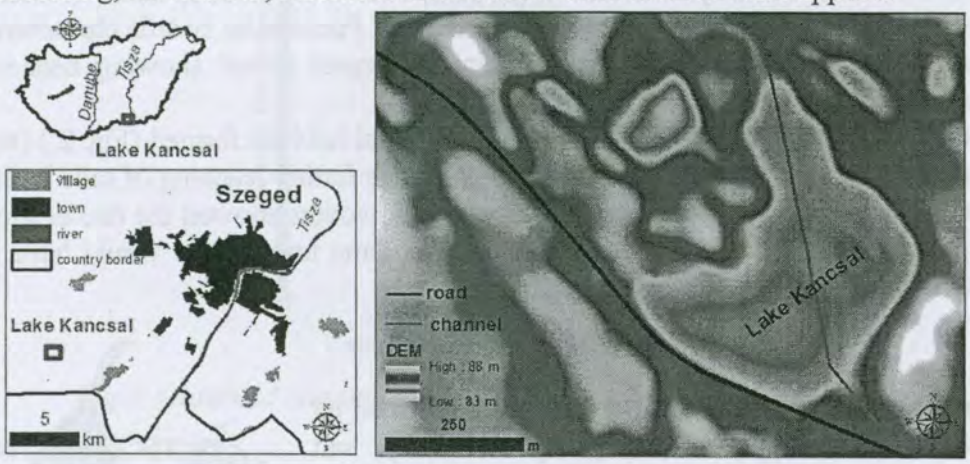

Fig. 1. The location and the DEM of the sample area (Lake Kancsal)

RESULTS

Vegetation

A changing habitat pattern was observed in the lakebed (Fig. 2.) due to the lack of water-cover and the sinking groundwater-table as a result of the draining effect of the crossing channel and the decreasing precipitation related to climate change. At present in the lack of water retention in the channel, water is not retained in the lakebed even in spring period which would be needed by the characteristic alkaline vegetation.

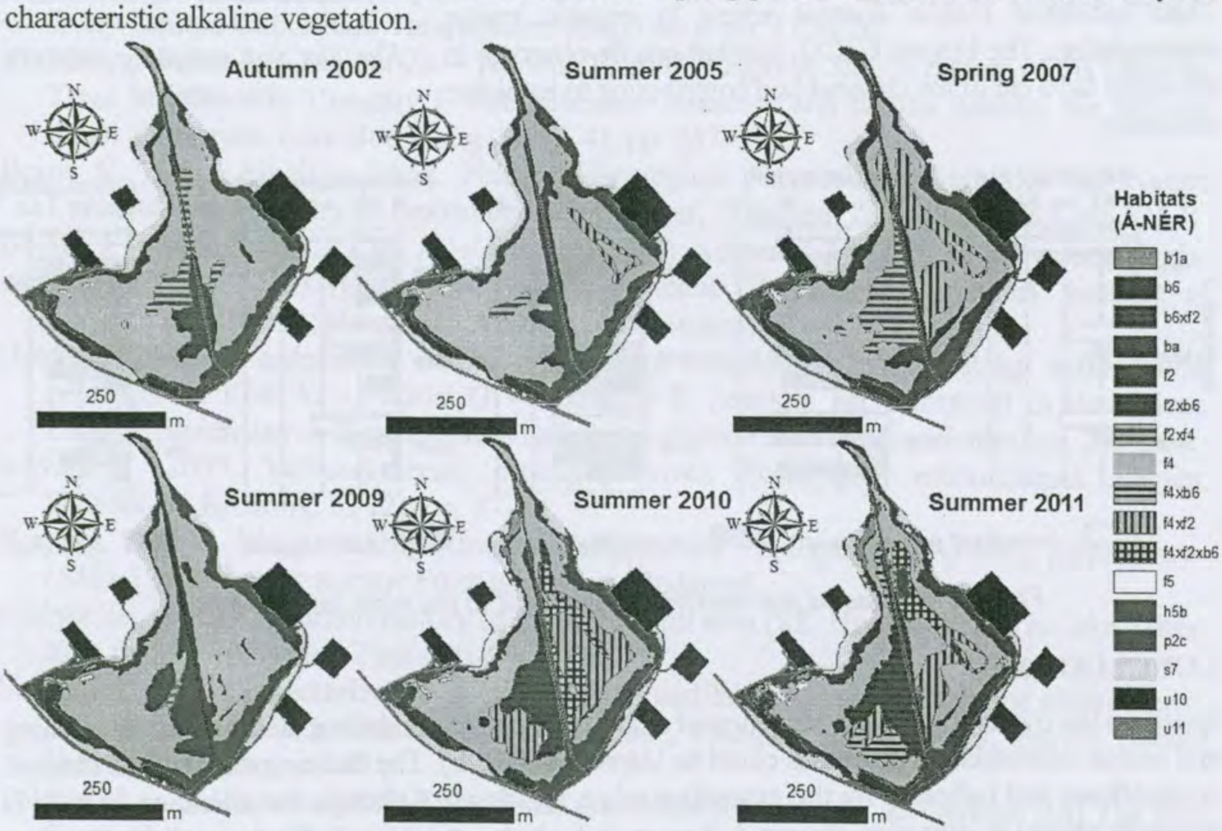

Fig. 2. Habitat-changes of Lake Kancsal in the last decade (key according to A-NER)
b1a: reed; b6: salt marsh; ba: channel; f2: salt meadow; f4: Puccinellia sward; f5: annual salt pioneer sward; h5b: closed sand steppe; p2c:Invasive schrub dominated stands; s7: Non-native tree species; u10: hamlet; u11: road. (transitional habitats indicated by „x")

An increasing extent of saline meadows along the channel could be identified (characteristic species are *Agrostis stolonifera, Cirsium brachycephalum, Cynodon dactylon, Dactylis glomerata, Festuca pseudovina, Festuca arundinacea-pratensis, Lepidium crassifolium).* Annual salt pioneer swards occur only in small extent (*Lepidium crassifolium*) and *Puccinellia* swards decrease significantly (*Puccinellia limosa*). Nevertheless, *Puccinellia* swards characterised by the highest naturalness have been still occurring in the largest extent showing near-surface salt accumulation in the lakebed.

Due to the extreme precipitation in 2010, more transitional habitats formed (Fig. 2.) (transition of saline meadow/*Puccinellia* sward/salt marsh) showing the further leaching of salts in the area due to the channel without water-retention. Temporary water-covers showed the rise of groundwater-table in spring and early summer, proving that the extreme humid year would have helped the regeneration of the lake in case of water-retention.

Soil

The pattern observed in the case of the habitats is reflected by the attributes of the upper-soils (Fig. 3). Alkalinity, salt content and phenolphthalein alkalinity – according to the salt tolerance of habitats – show significant decrease towards the channel. Annual salt pioneer swards are determined by the highest salt content, alkalinity, phenolphthalein alkalinity and less humus content. Soil parameters of salt meadows are characterised by the least salt content, alkalinity and phenolphthalein alkalinity along the channel, which refers to the leaching of soils due to the draining effect of the channel. Their increased humus content refers to organic matter accumulation. The highest $CaCO_3$ content can be observed in the upper 0-10 cm of the channel-bed contributing to its higher alkalinity.

Fig. 3/a. Soil sampling points in the lakebed

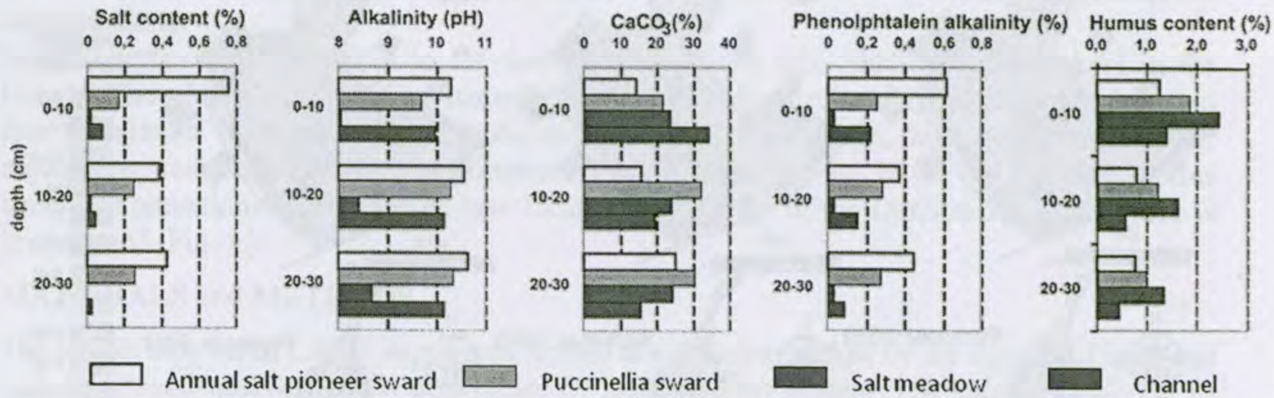

Fig.3/b. Measured parameters of upper soil in the main habitat-types

CONCLUSIONS

Based on the dynamics and the tendency of examined parameters drying, desalinization, leaching and humus accumulation processes could be identified (Fig. 4.). The draining effect of the channel is significant and indicated by the extending saline meadows. Although the alteration of soils is generally related to centuries, the rapid changes in hydrology can have effect on soils in decades. The vegetation proved to be a good indicator of the changes.

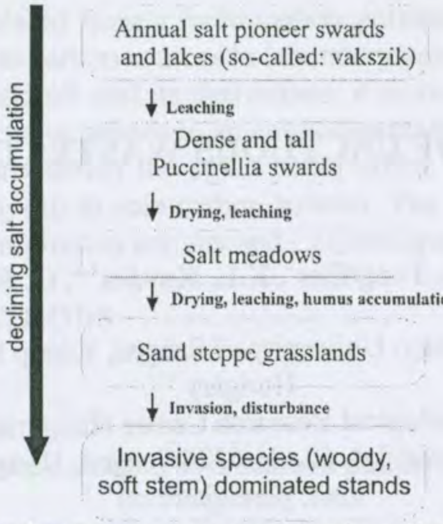

Fig.4. Observed ongoing processes (altering alkaline landscapes)

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