

# 300 years history of management of Hungarian floodplain meadow

## - habitat for the rare species *Fritillaria meleagris*



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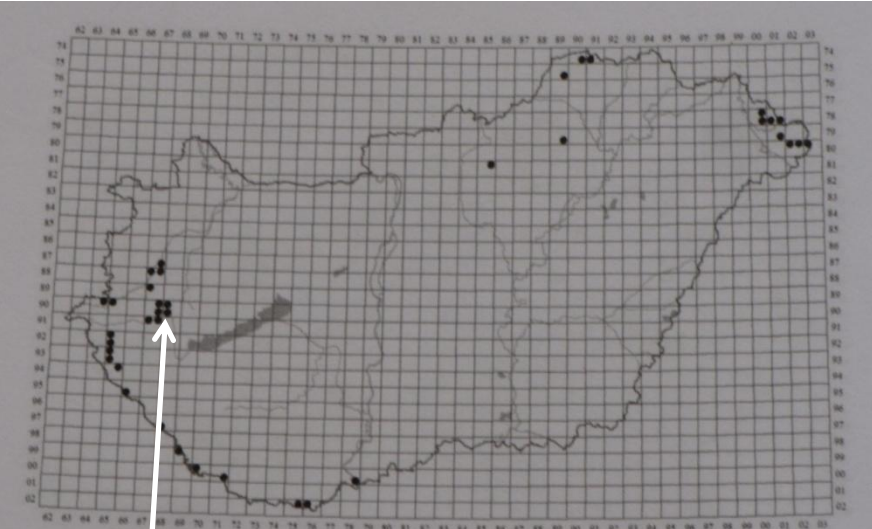
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### Introduction

In Hungary, *Fritillaria meleagris* is known as a species of riparian woodlands however, it forms large populations only on the meadows which appeared after the woodland clearance when light availability substantially increases. The species flowers in early spring (April) with almost no competition from other meadow plants. Mowing meadows at the right time is favourable for seed spread.

### Material and methods

We monitored a population on floodplain of the small river Zala in Western Hungary. To explore the history of the land use on this site we used the maps from the Military Surveys of Hungary (1784-1941), aerial photographs (1955-2016) and documents from archives. We surveyed the habitats, recorded the number of flowering *Fritillaria* individuals and other protected plants over five years of observations (2012-2016).



Distribution of Fritillaria meleagris in Hungary. Arrow shows the monitored area in river Zala region.



River Zala and the meadows. Mill can be seen in the background, what earlier was functioning as water mill.



### Results - History of landscape and management

The first written records of the settlement (Tüskeszentpéter) are dated at 1166. The village was built in a meander of the river. By 1784, the area was occupied by wet meadows and only small fragments of forests could be seen on the map. The main livelihood was animal husbandry which required a lot of hay to be stored for winter. Floodplain hay meadows were the most productive, however in 1895-1930 most of meadows were transferred into the arable fields, after the river Zala flow became regulated. Small-scale farming had almost disappeared by 1960s, because of 'collectivization'. Big hay-cut machinery had started to be used and can still be seen on the meadows nowadays.



I. Military Survey (1784) and II. Military Survey (1856)

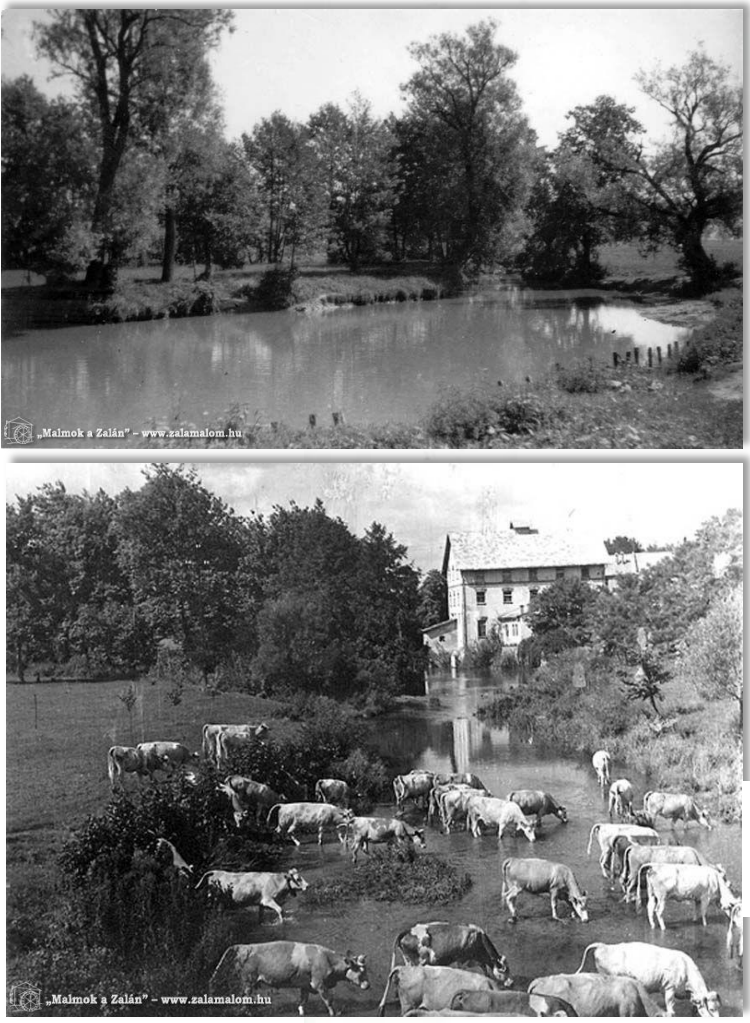


III. Military Survey (1879) and Military Survey (1941)



Military History Museum (1955) - before the collectives

There were about 35 mills on the small river Zala until the 1960's years. Mowing was the main land use, but the grazing was also important.

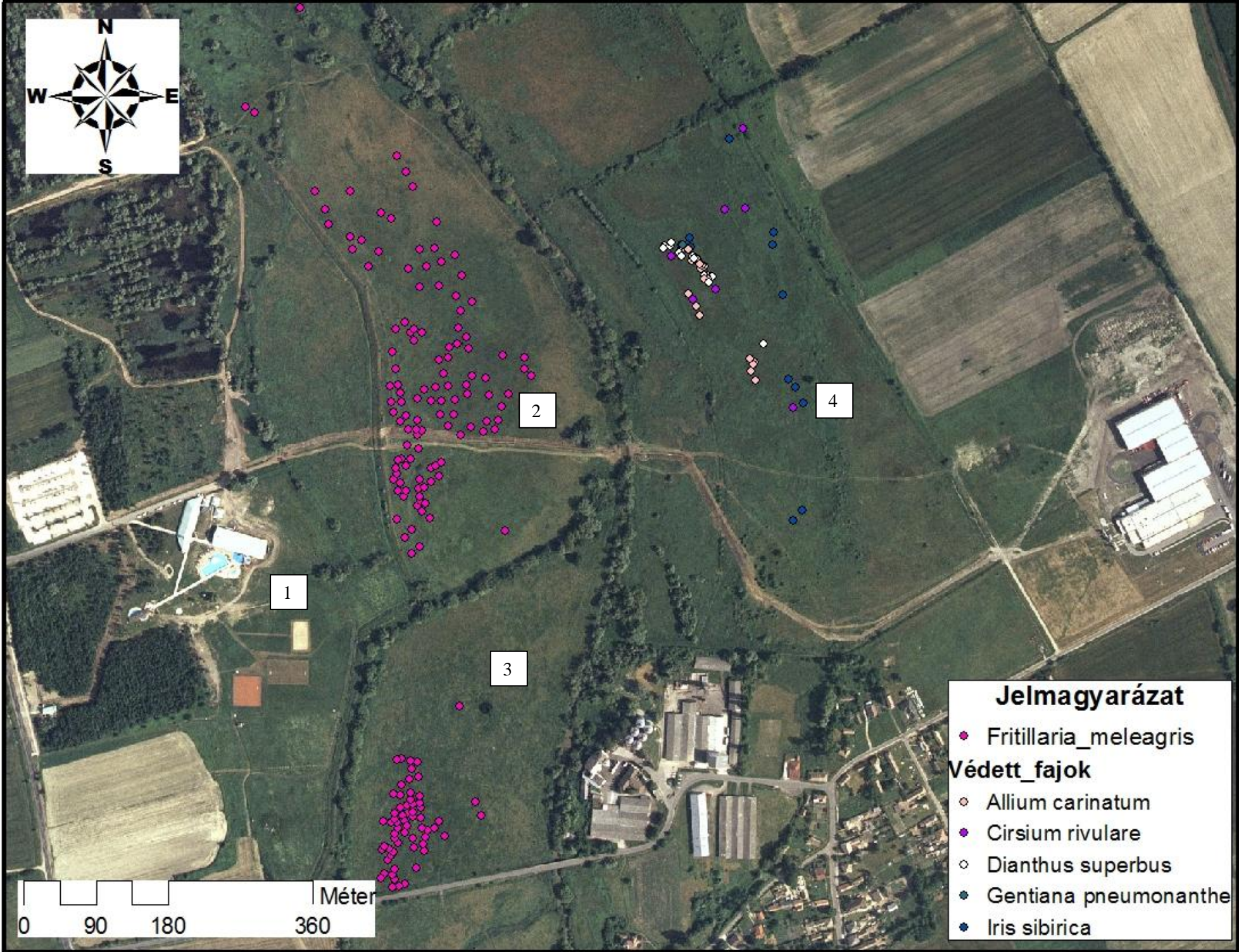


During the collectives 02. 05. 1966 and 09. 03. 1975 (fentrol.hu)

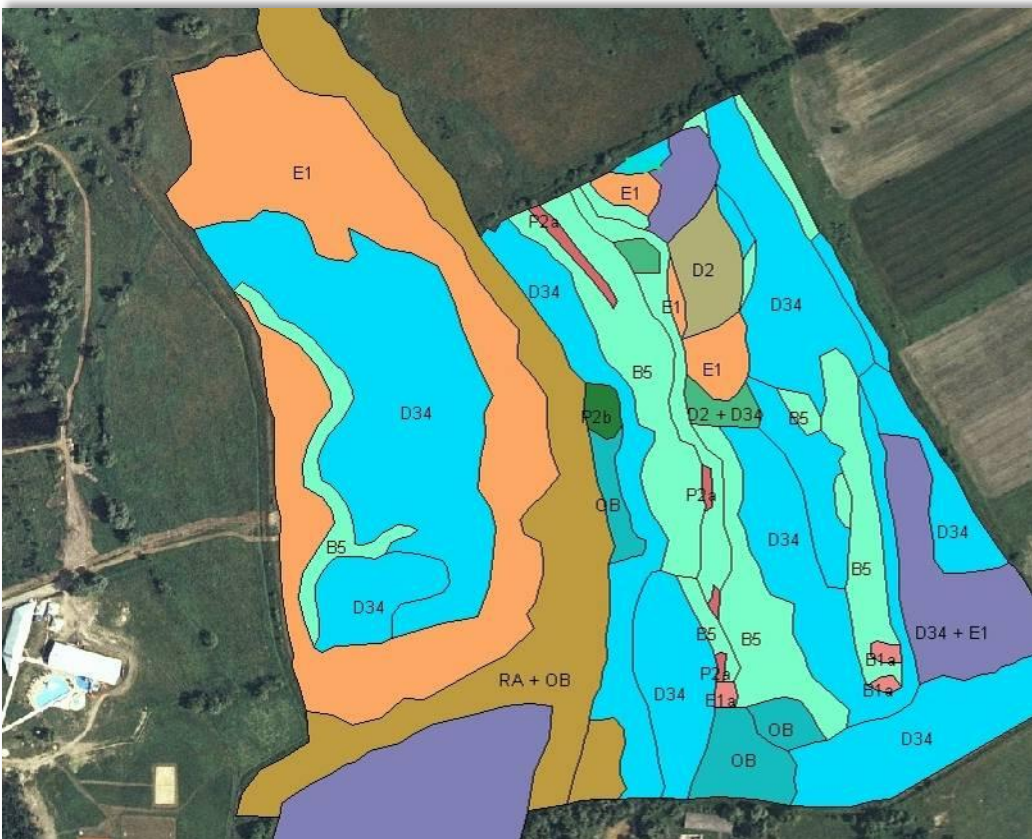


Last days of collectives 15. 08. 1985. and today 2016 (fentrol.hu)

### Results - Protected plants and habitats



Occurrences of *Fritillaria meleagris* and protected plants in the monitored area (2016)  
(1-thermal spa, 2-meadow north, 3-meadow south, 4-meadow with many protected species, but no *Fritillaria*)



Habitat map according to the Hungarian system  
B5: Non-tussock beds of large sedges, D34: Mesotrophic wet meadows, E1: *Arrhenatherum* hay meadows, RA: Scattered native trees or narrow tree lines, OB: Uncharacteristic mesic meadows and tall herb communities



Habitat map according to the Natura habitats

6440: Alluvial meadows of river valleys of the *Cnidion dubii*, 6510: Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)

### Results - Botanical survey

Over five years of observations (2012-2016), the number of flowering *Fritillaria* individuals varied from 630 to 5314 between years. Fritillaries prefer the habitats of 'Alluvial meadows of river valleys' (6440) and 'Lowland hay meadows' (6510). Fritillaries grow on the right bank of the river Zala, however do not occur on the left bank. Although the habitats are similar on the two banks, we understood that the right bank with Fritillaries is regularly flooded in spring, but dries out during a summer. The left bank of the river with other protected species but no *Fritillaria*, is not flooded in spring however, groundwater stays near to the surface during the summer.

### Number of flowering individuals

Year	Spa	Meadow South	Meadow North	Sum of meadows	Total	Date of recording
2012	592	122	2694	2816	3408	05.04.2012
2013	764	150	480	630	1394	24.04.2013
2014	1072	920	1483	2403	3475	26.04.2014
2015	no data	700	1321	2021	no data	04.04.2015
2016	no data	810	4504	5314	no data	02.04.2016

### Results - Effect of flooding

Our data showed that the number of flowering plants is affected by floods. In 2013, after a very wet spring, the intensity of Fritillary flowering was moderate, but in 2016 lots of flowering plants were counted in the area after the high water level in March. If the meadow remains under water for too long as in 2013, it does not favor Fritillary population; however if the flood finishes by the beginning of April (2016), it is an optimal condition for the plants.



12.04.2013.  
The meadow is flooded. The old bed of the river can be seen on the meadow. Local people are searching for fish. The flowering period was over by that time in 2012.

25.04.2013.  
Fritillaries are blooming on the upper parts of the meadow in the shallow water, but in the deepest parts are still under water. Children are searching for fish.

### Conclusions

Fritillary population occur only in areas which have been continuously managed as hay meadows, both non-improved or semi-improved for more than 300 years. Although traditional animal husbandry is no longer economically sustainable in Hungary, the EU supports traditional management to be continued on historic floodplain meadows.