Mapping of invasive alien plants along the common middle section of river Ipoly (Hungary / Slovakia): methodology, management, evaluation

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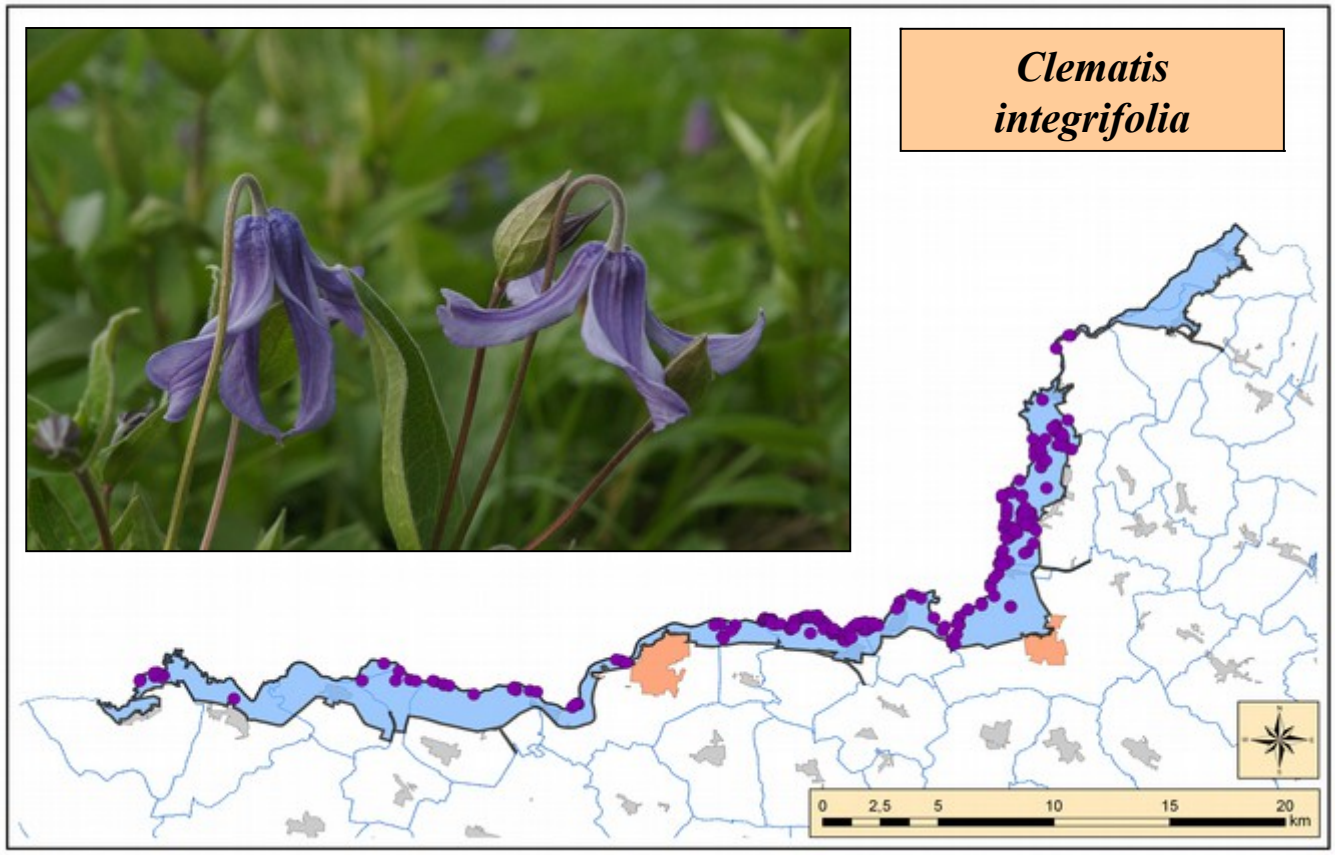
„Managing invasive plant and animal species in the protected areas of Central and Eastern Europe” **WS- Hortobágy, 03.05.2016.**

Topics

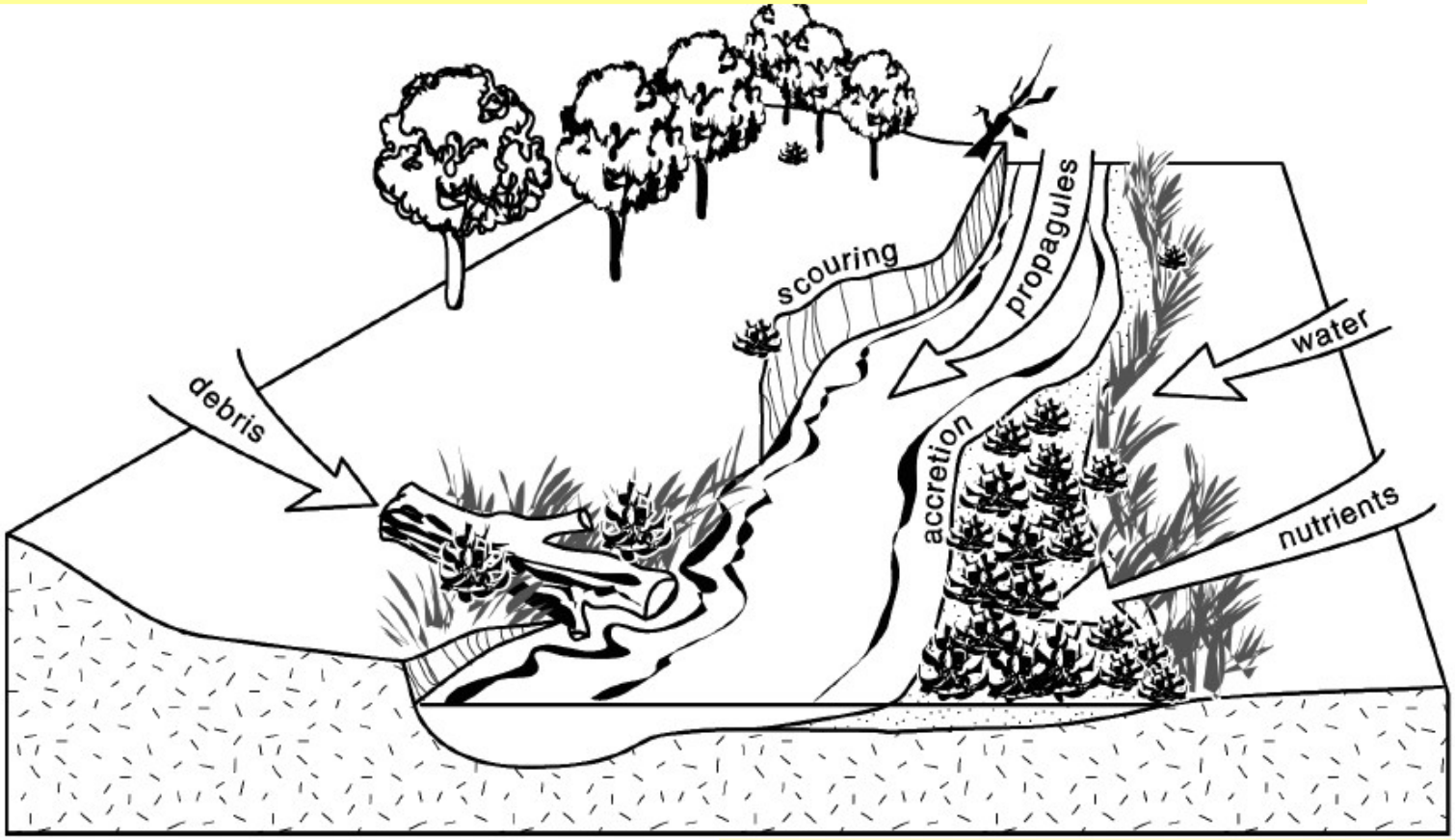
- Alien invasive plant species and connections with floodplains
- Regional scale survey of invasive plants along the Ipoly (SK: Ipel', D: Eipel) river / in different scales: catchment area - active floodplain - litoral zone
- Investigations have to based the proper management (erradication) schemes

- Rivers are one of the most important eco-corridors
- Riverine habitats are one of the most invaded habitats (beside ruderal habitats) – shorelines are typical ecotons between the wetland and the water body)
- Distribution patterns along floodplains show many similarities in the case of „good" (protected, threathened) and invasive plant species in regional scale (river corridor plants „*Stromtalplanzen"* see Burkart 2001)



Floodplains are regarded as **'landscape sinks'** – the main reason of the success of invasive plant species

- Inflowing debris and flooding create canopy gaps
- Floods bring propagules (seeds, plant fragments, floating mats) of opportunistic species
- Flooding supplies water and nutriens that accelarate invasion



after ZEDLER – KERCHER (2004)

Regional invasive surveys at Ipoly catchment area

- Aim of the study was to investigate the state of the invasiveness of the studied area
- In the frame of EU Intereg ill. NatuRegio project (2005 and 2010/2011)
- Complex metodology:

– sampling areas / transects (200 $m^{2)}$ at Ipoly river and tributaries in the catchment area

– Dot-mapping along the riverside in the common border line section (between Balassagyarmat – Kalonda municipalities; altogether 2x52 km)

About the methodology

Remore sensing *versus* data collecting in fieldwork

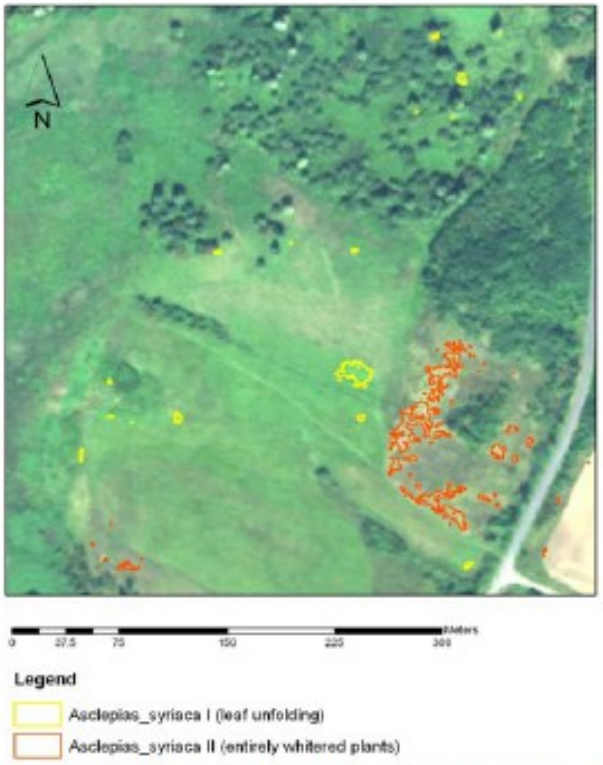
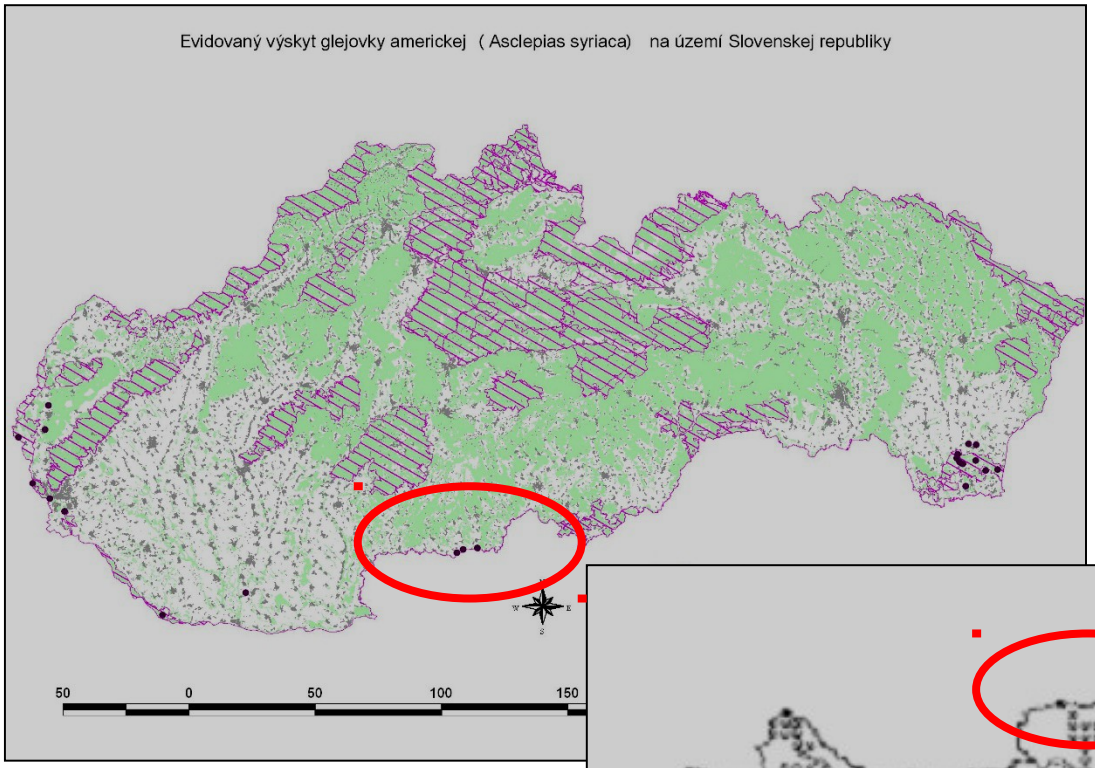


Figure 2 Map of the milkweed (Asclepias syriaca) infestation detected at study area 02 (Hugyag) on a tru-color image.

- Cost efferctive, but time demanding
- Shaded shoreline of the river with sparse tree cover → not sufficient for airborne imagery
- First invader populations of IAS with small extent of density are much more detectable in terrain
- Possiblility for mapping other floristic occurences

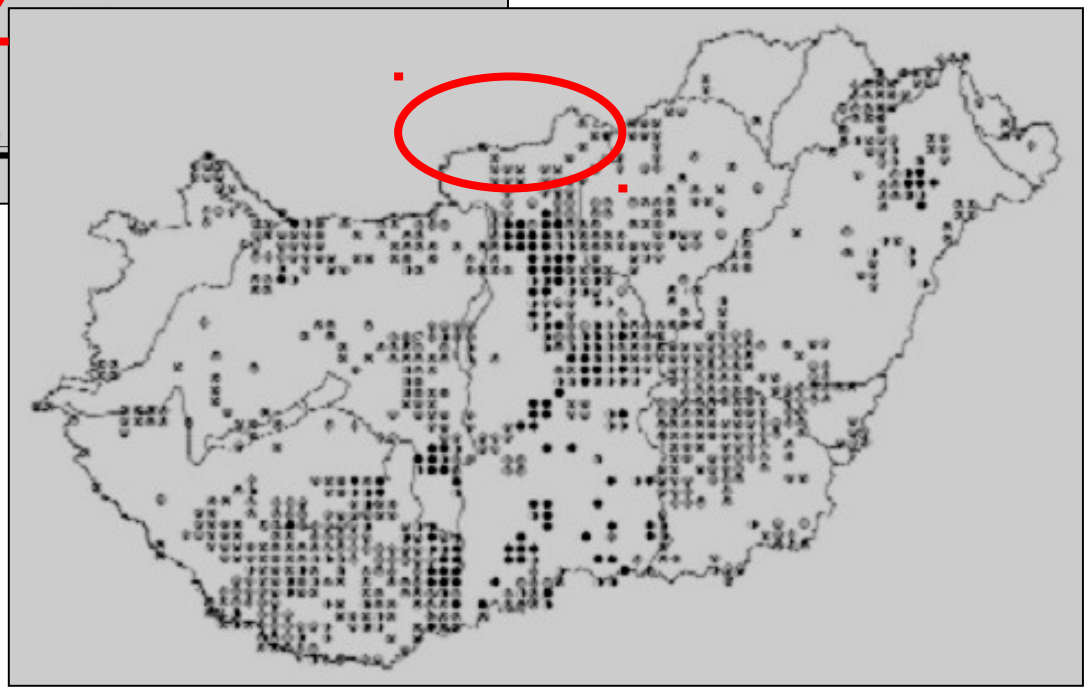
Burai et al. (2011) WHISPERS conference

Cross-border approach



Štátna ochrana prírody SR (2011)

Balogh et al. (2007)



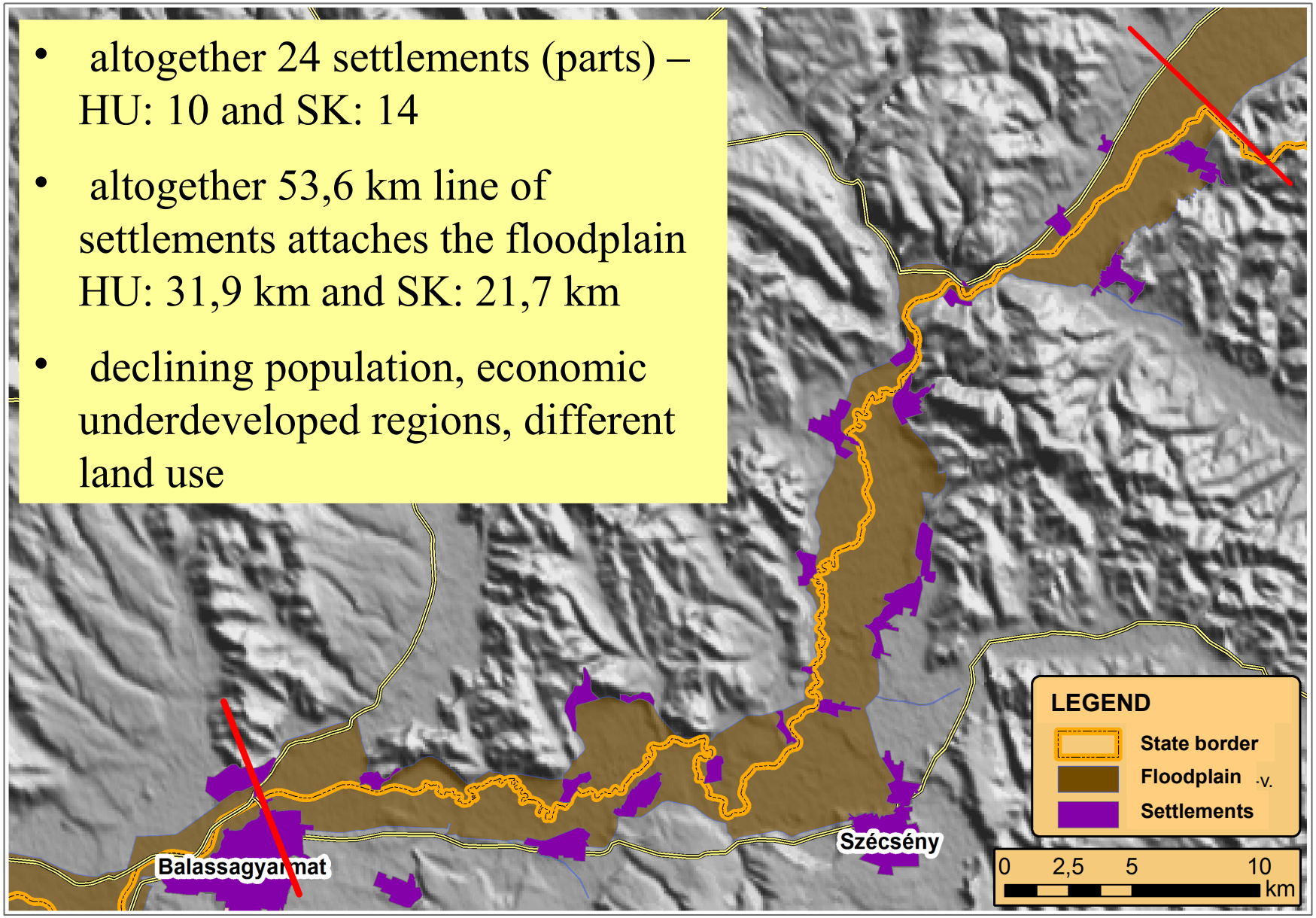
POZOR !
Štatna hranica
prechádza
stredom rieky

Study area

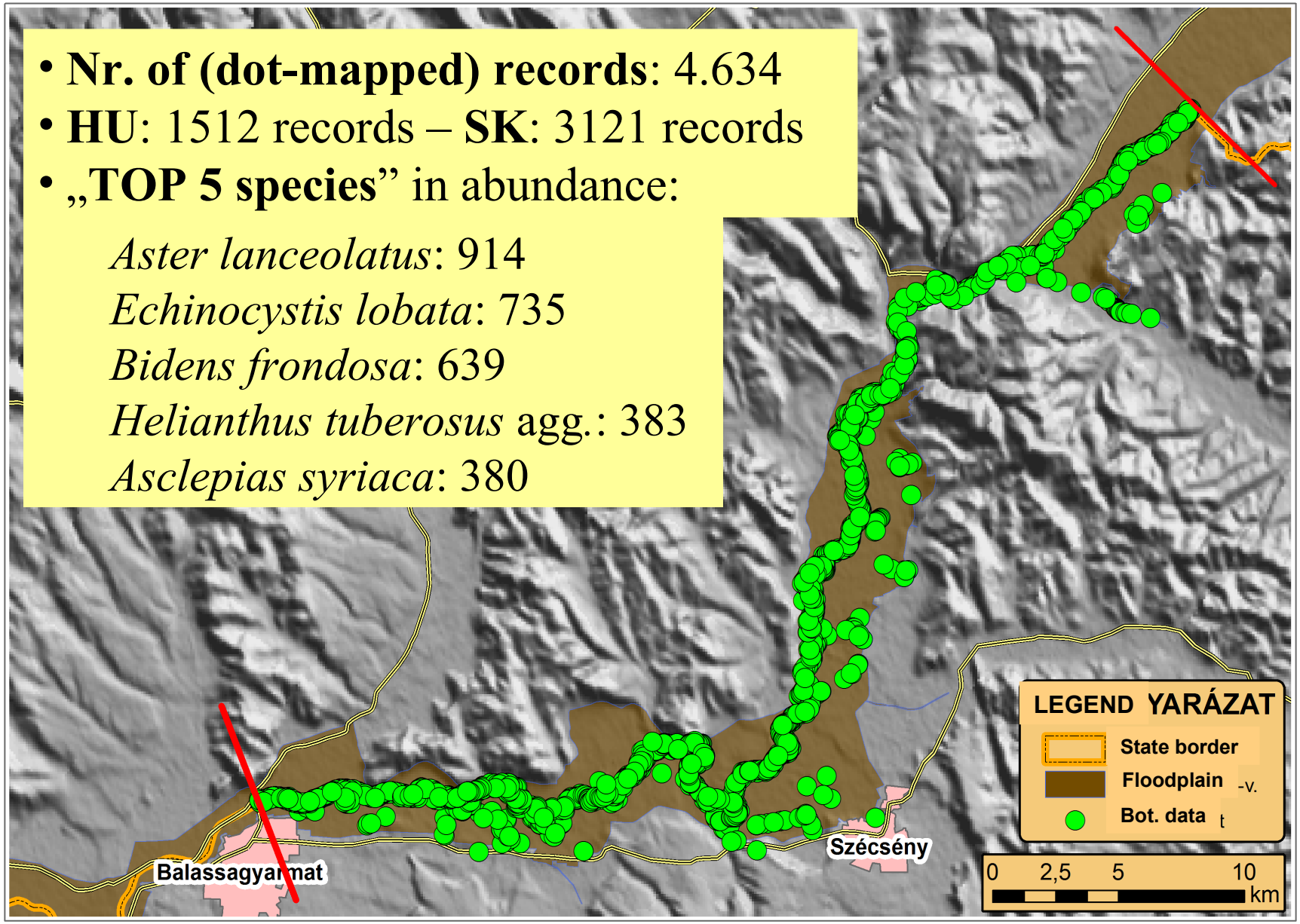

SLOVAKIA
HUNGARY
165m
148,5 fkm
Hungary
Slovakia
96,4 fkm
141m
Balassagyarmat
Szécsény
LEGEND
State border
Floodplain
0 2,5 5 10
km

Landscape pattern - settlements

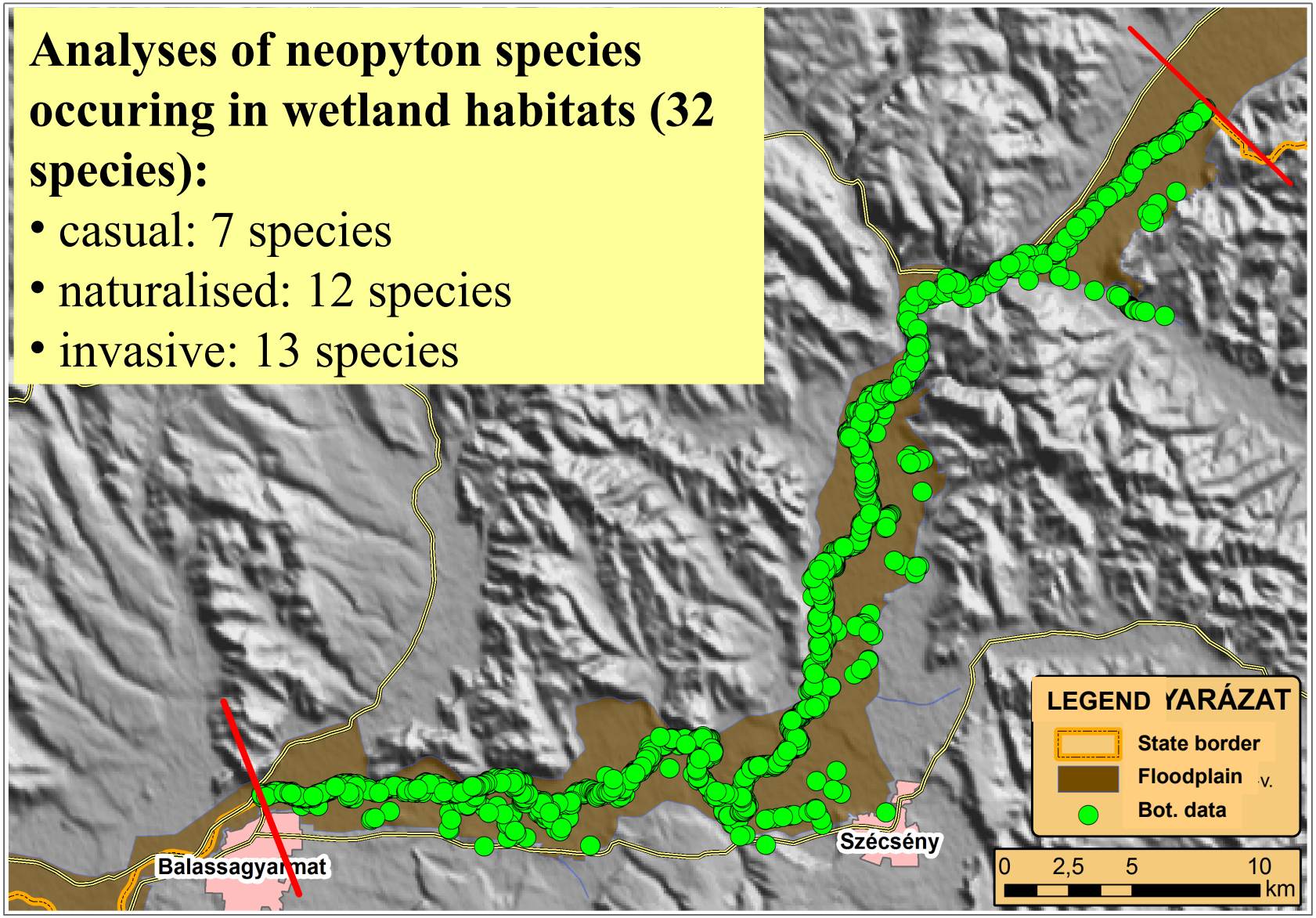
- altogether 24 settlements (parts) – HU: 10 and SK: 14
- altogether 53,6 km line of settlements attaches the floodplain HU: 31,9 km and SK: 21,7 km
- declining population, economic underdeveloped regions, different land use



Results - in numbers



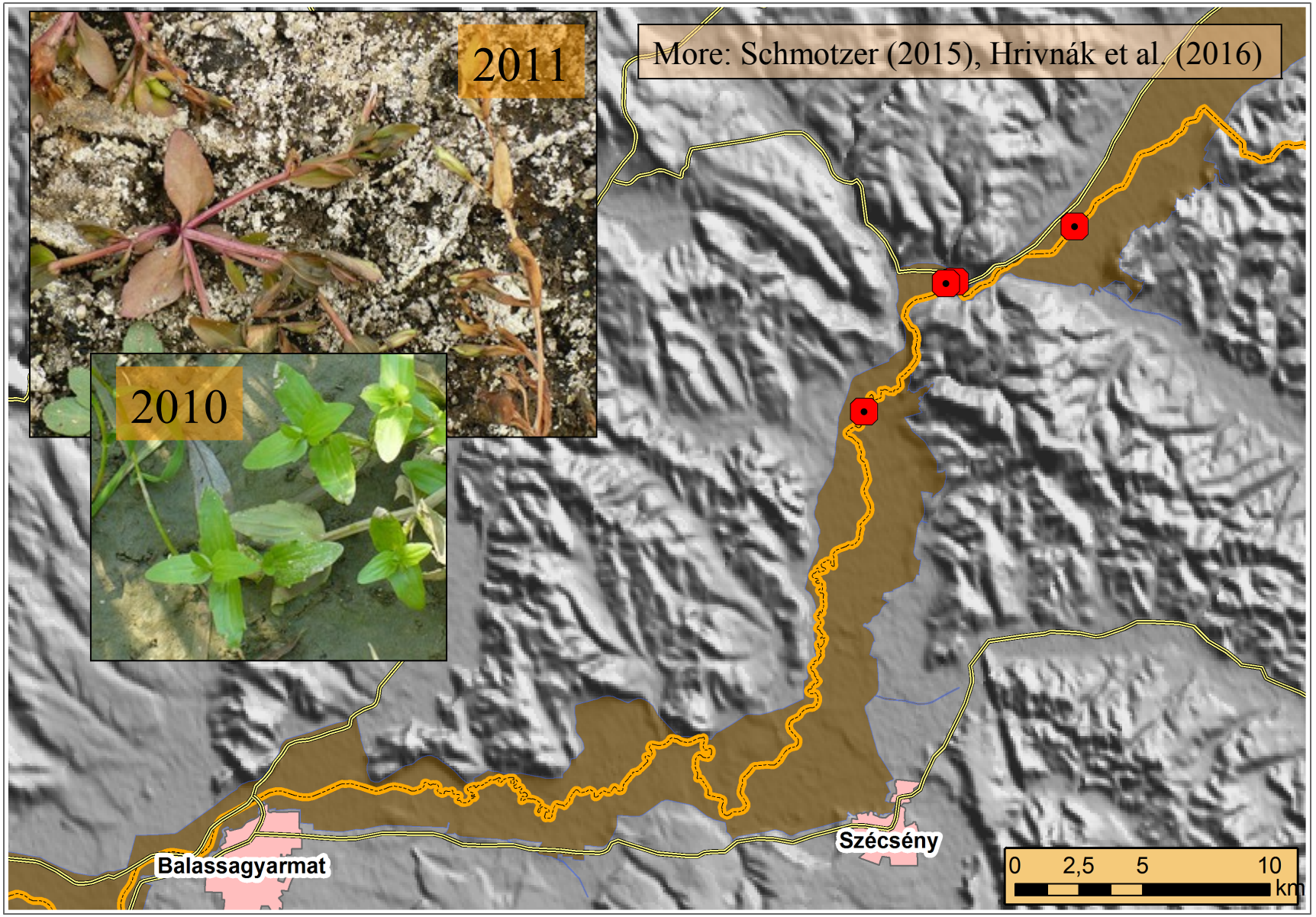
Result - categorisation of the species



Categorisation of the species

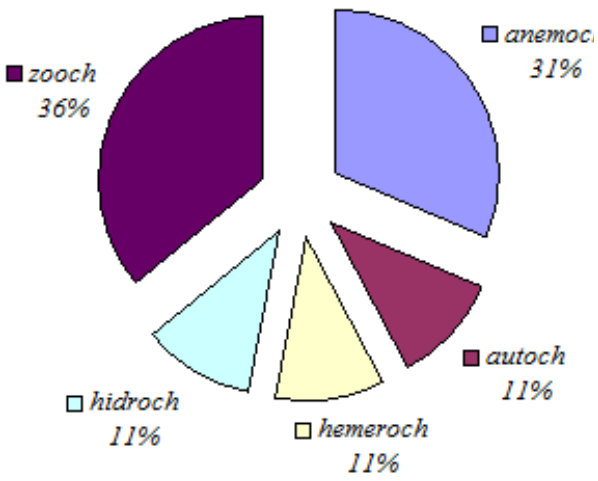
CASUAL (7)	NATURALISED (13)	INVASIVE(14)
Abutilon theoprasti	*Ambrosia artemisiifolia*	*Acer negundo*
Ailanthus altissima	*Conyza canadensis*	*Amorpha fruticosa*
Celtis occidentalis	*Erigeron annuus*	*Asclepias syriaca*
Elaeagnus angustifolia	*Galinsoga parviflora*	*Aster spp.*
Galinsoga ciliata	*Impatiens parviflora*	*Bidens frondosa*
Lindernia dubia	*Juglans regia*	*Echinocystis lobata*
Lycopersicon esculentum	*Morus alba*	*Fraxinus pennsylvanica*
	Oxalis stricta	*Helianthus tuberosus* agg.
	Parthenocissus spp.	*Impatiens glandulifera*
„EXPECTANT" SPECIES (2)	*Robinia pseudo-acacia*	*Reynoutria x bohemica*
Iva xanthiifolia	*Veronica persica*	*Solidago canadensis*
Rudbeckia laciniata	*Vitis vulpina*	*Solidago gigantea*
		Xanthium italicum

New floristic data! – *Lindernia dubia*

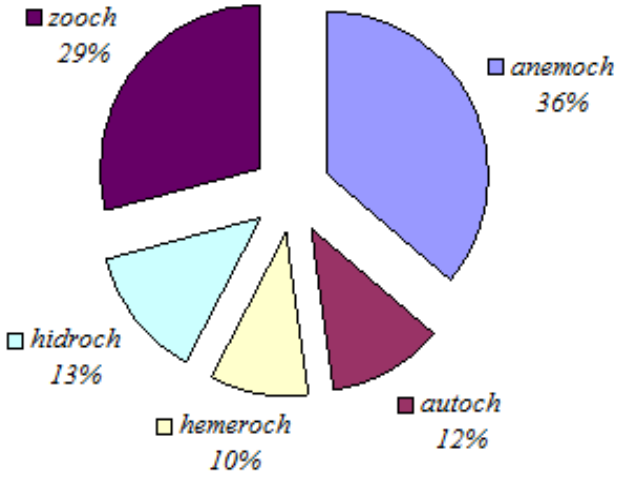


Results – dissemination drivers

- normal and weightened measurement (for 32 species)
- anemo- and zoochoria are dominated, but
- also variable dispersion ways → well-correleated with dispersal routes

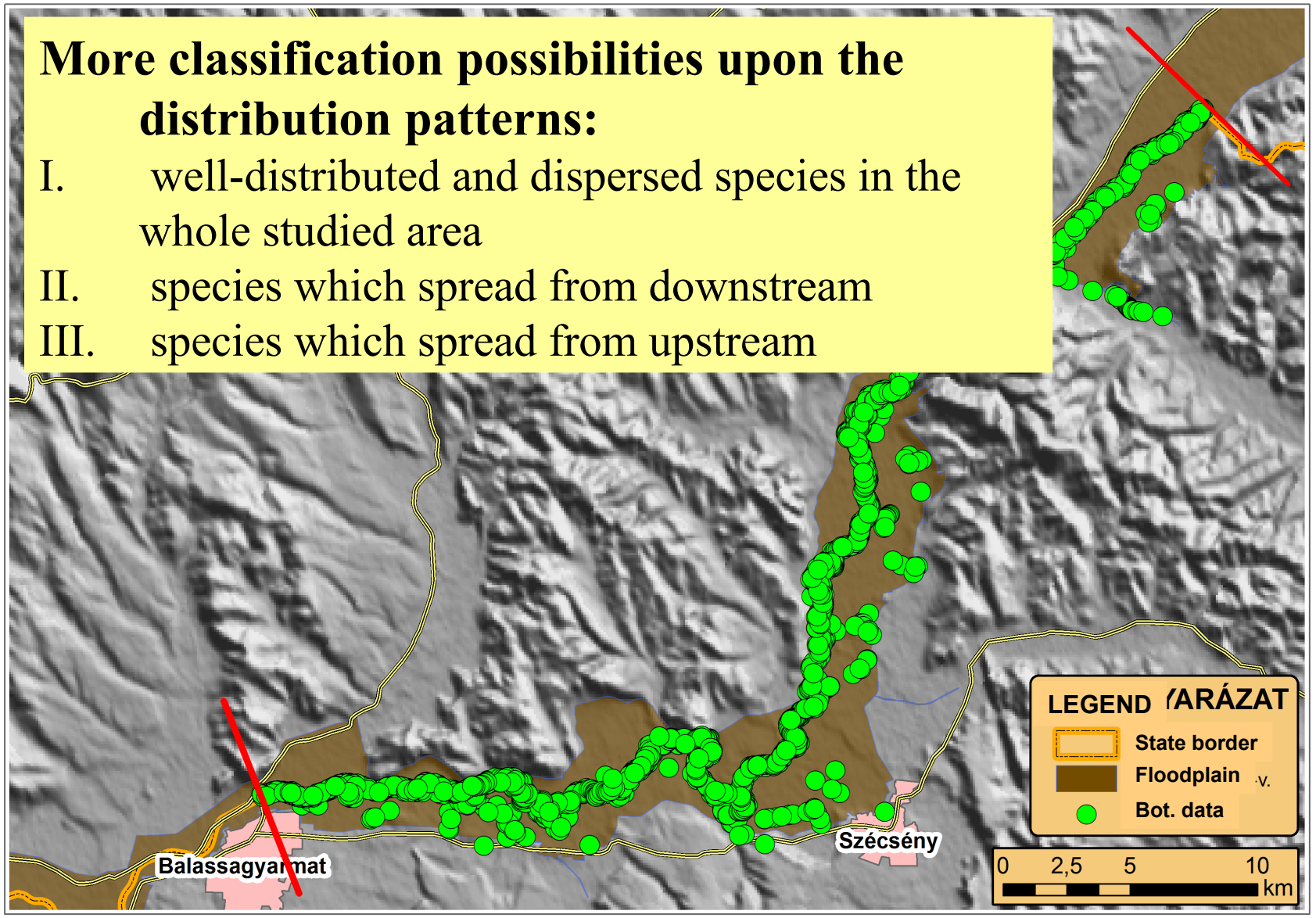


Normal %

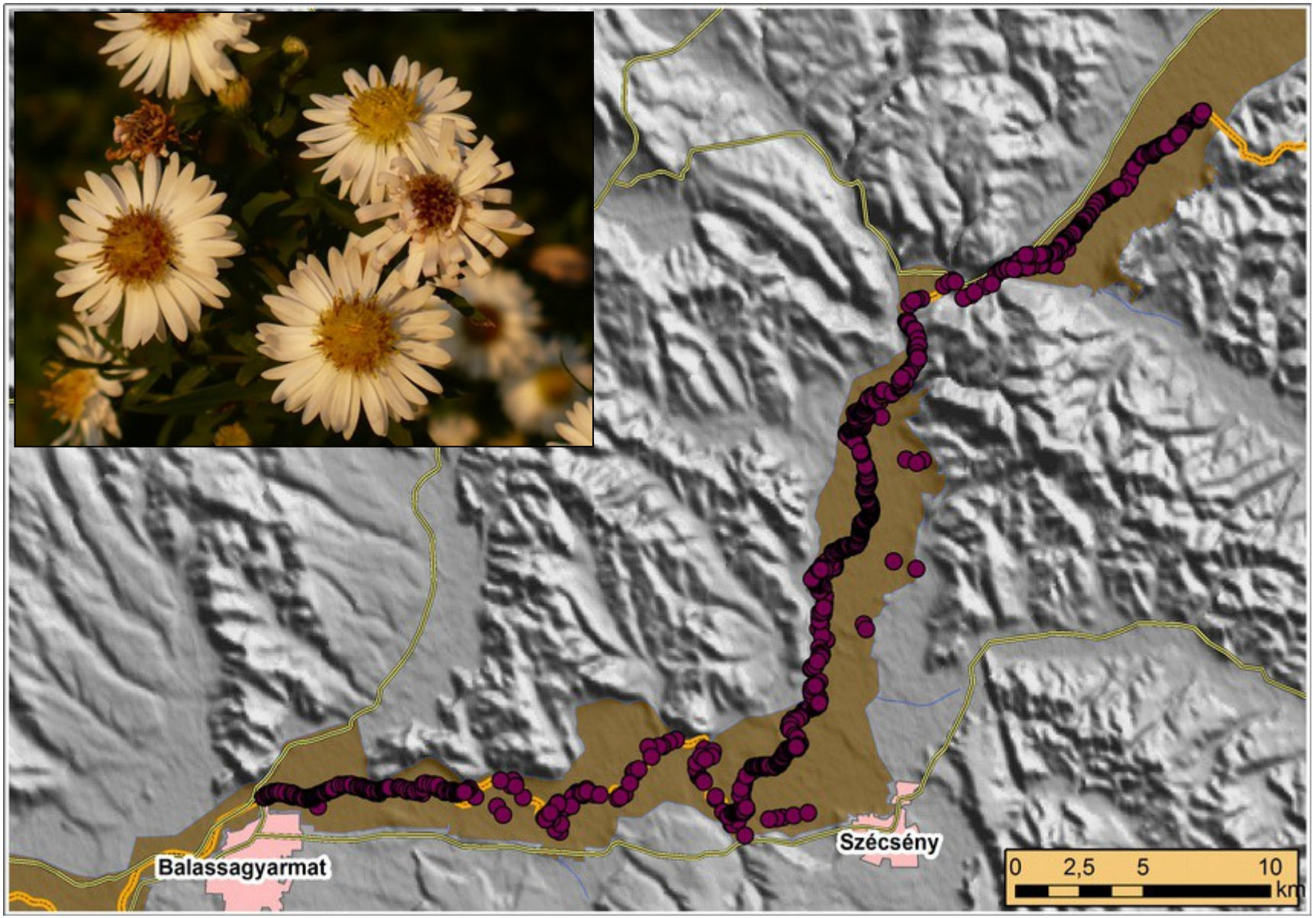


Weightened %

Evaluation in floristic level



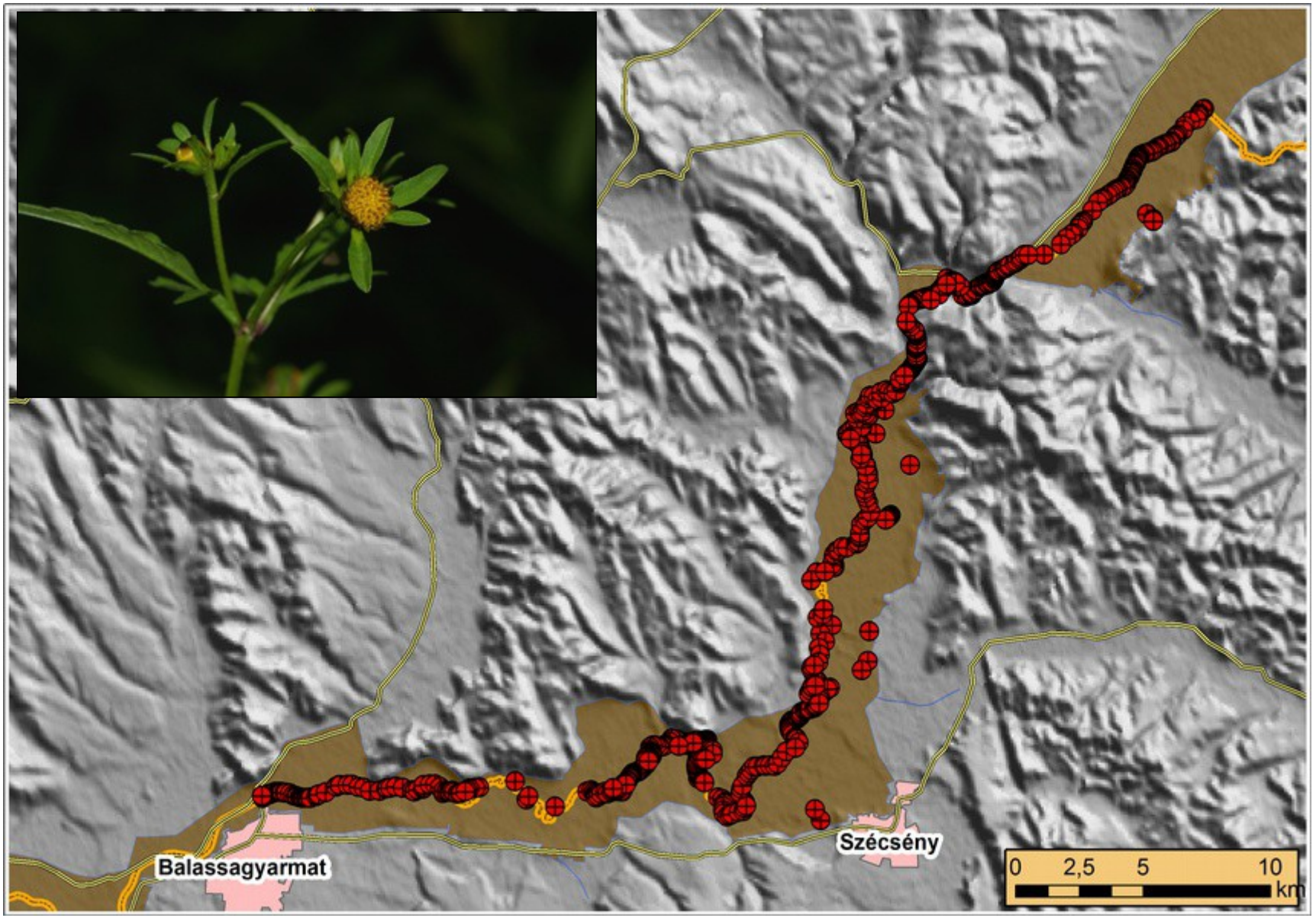
Pattern I/1. *Aster lanceolatus*



***Characteristics of the species**:*

- creates homogenous stripes along the river bed
- The abandoned parcels of the settlements are regarded important secondary infection sources
- up to 1.000 m^2 large homogeneous patches

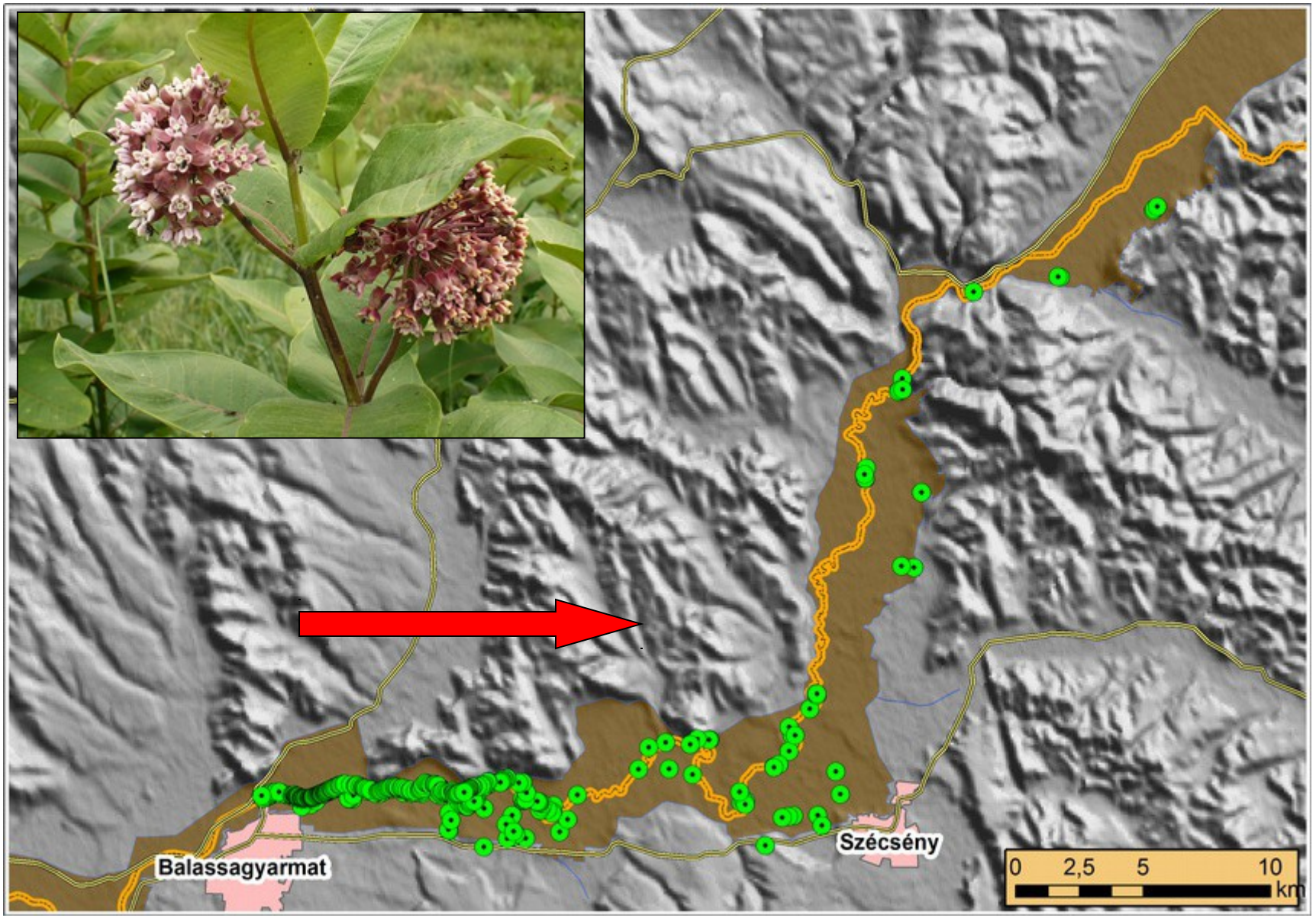
Pattern I/2. *Bidens frondosus*



***Characteristics of the species**:*

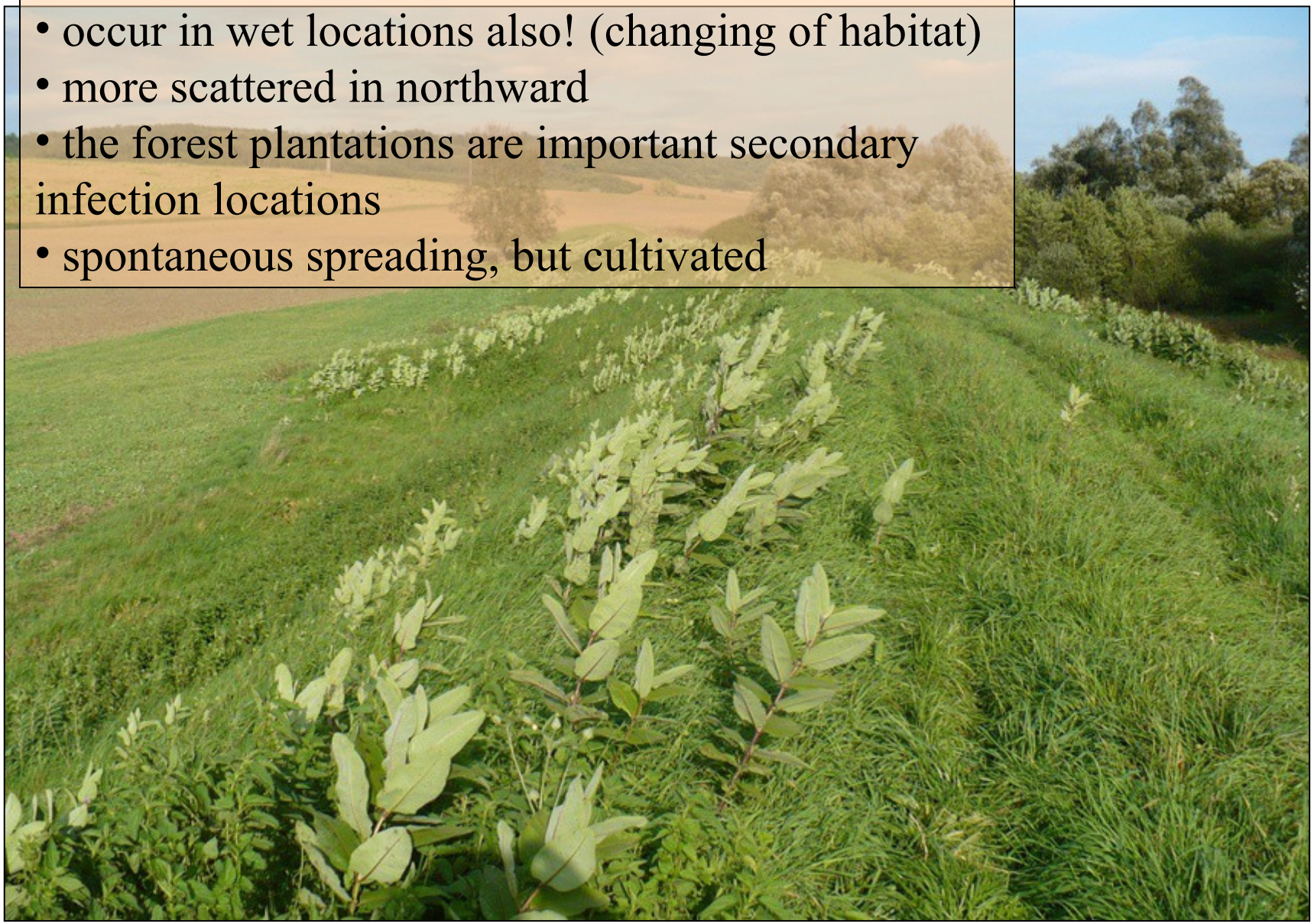
- a 'newcomer' – spreads intensively after the high floods of the year 2010
- better colonisation ability than the relative B. tripartita (Köck 1988)
- cause significant economic damage (devaluation of meadows, collapse of grazing)

Pattern II. *Asclepias syriaca*

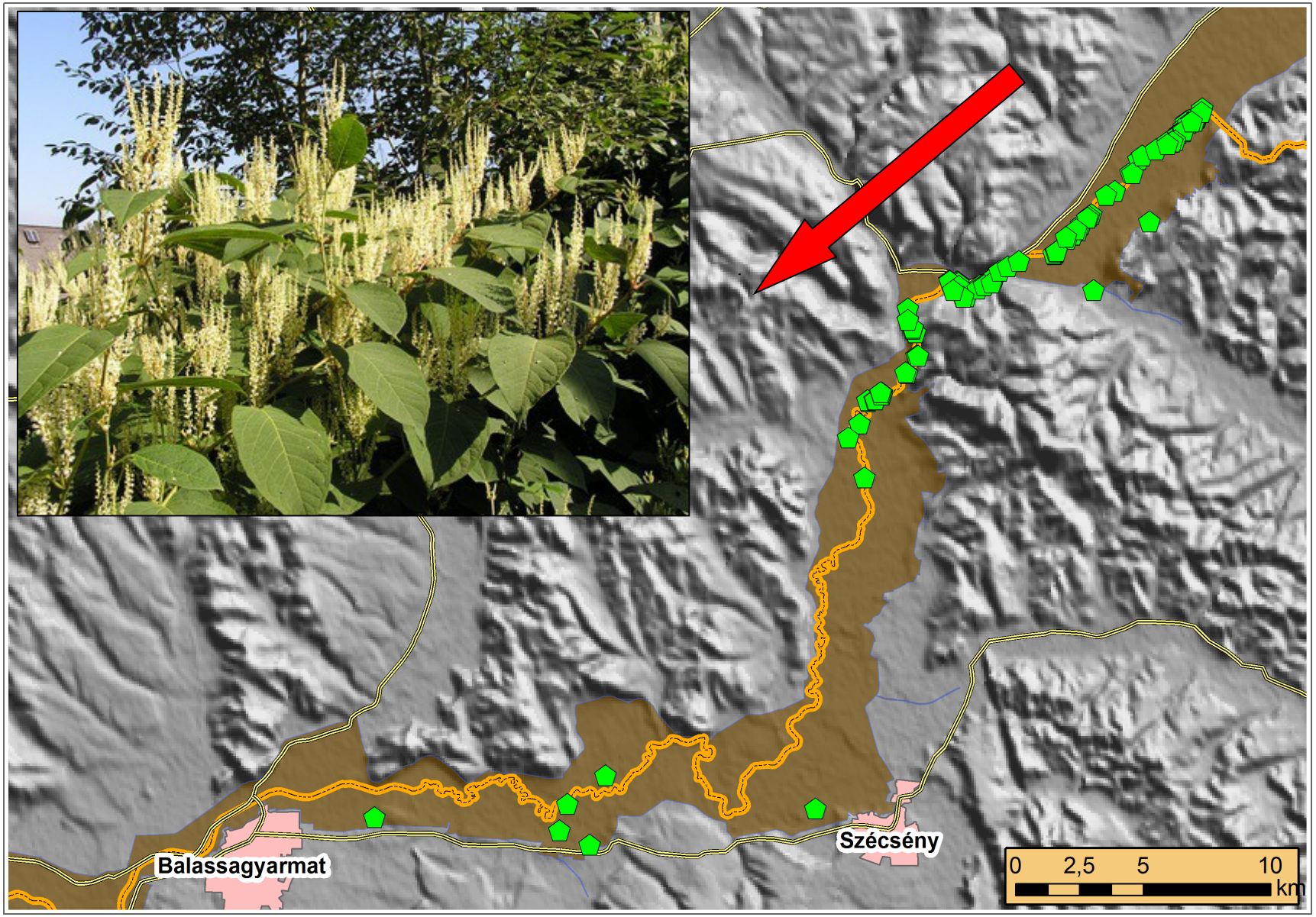


Characteristics of the species:

- invaded rapidly the river section with dikes
- occur in wet locations also! (changing of habitat)
- more scattered in northward
- the forest plantations are important secondary infection locations
- spontaneous spreading, but cultivated

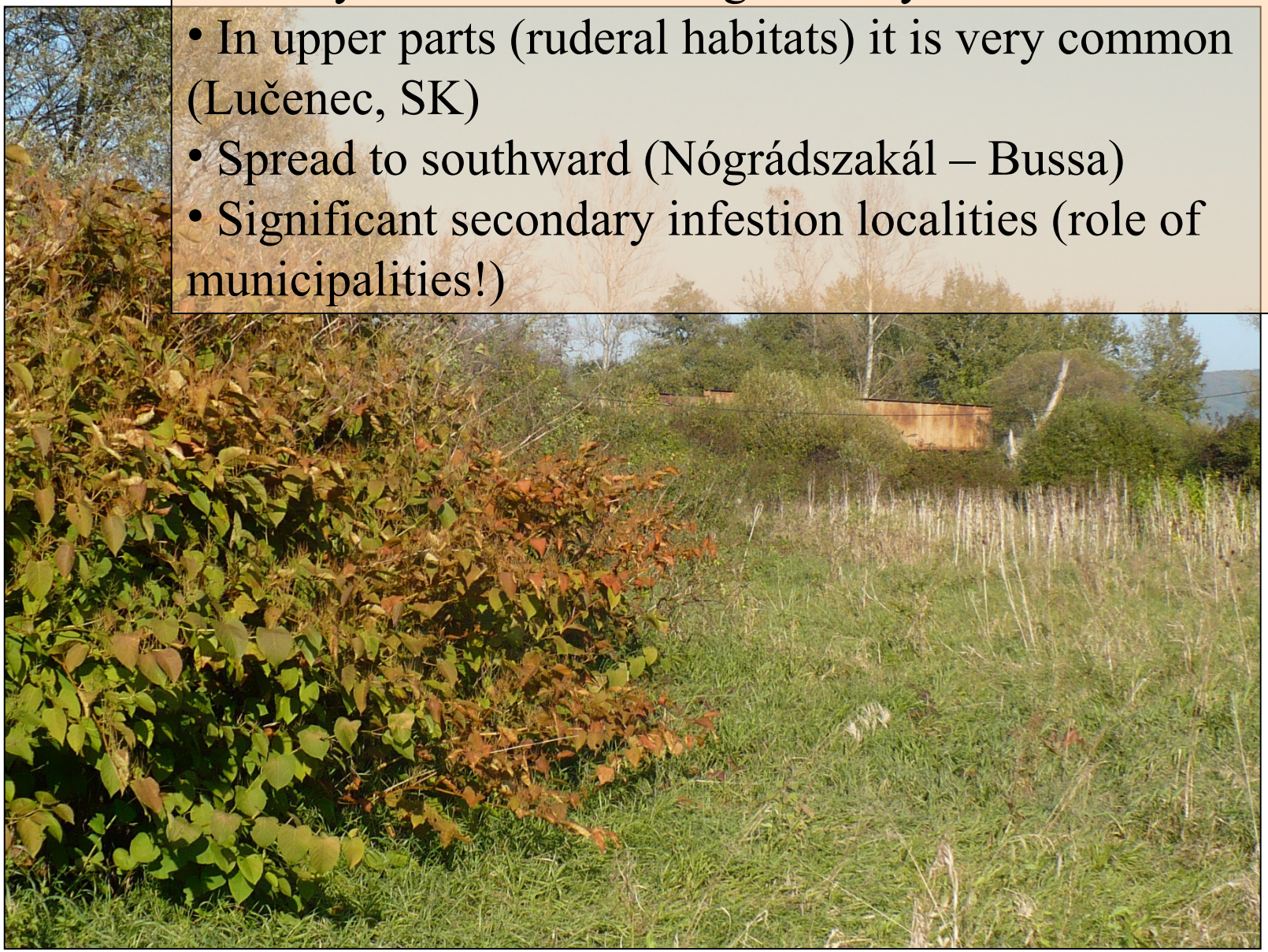


Pattern III/1. *Reynoutria x bohemica*



Characteristics of the species::

- Mostly concentrates along the very riverside locations
- In upper parts (ruderal habitats) it is very common (Lučenec, SK)
- Spread to southward (Nógrádszakál – Bussa)
- Significant secondary infestion localities (role of municipalities!)



Spreading routes, infection sources I.

- The **Ipoly river** continues to extend the invasive species propagules (esp. hydrochoric species)
- The outfall of water inflow (brooks) from the hilly areas deliver large amounts of invasive plant propagules
- The role of the settlements are very important secondary infection localities (e.g. abandoned parcells)
- Linear constructions (roads, railways, embankments, bridges, irrigation canals, etc.)
- Fallow lands, unmanaged sites


SOLI_CAN
ECHI_LOB

Spreading routes, infection sources II.

- The Ipoly river continues to extend the invasive species propagules (esp. hydrochoric species)
- The outfall of water inflow (**brooks**) from the hilly areas deliver large amounts of invasive plant propagules
- The role of the settlements are very important secondary infection localities (e.g. abandoned parcells)
- Linear constructions (roads, railways, embankments, bridges, irrigation canals, etc.)
- Fallow lands, unmanaged sites


ACER_NEG
SOLI_CAN

Spreading routes, infection sources III.

- The Ipoly river continues to extend the invasive species propagules (esp. hydrochoric species)
- The outfall of water inflow (brooks) from the hilly areas deliver large amounts of invasive plant propagules
- The role of the **settlements** are very important secondary infection localities (e.g. abandoned parcells)
- Linear constructions (roads, railways, embankments, bridges, irrigation canals, etc.)
- Fallow lands, unmanaged sites


HELI_TUB
ASTE_LAN
ECHI_LOB

Spreading routes, infection sources IV.

- The Ipoly river continues to extend the invasive species propagules (esp. hydrochoric species)
- The outfall of water inflow (brooks) from the hilly areas deliver large amounts of invasive plant propagules
- The role of the settlements are very important secondary infection localities (e.g. abandoned parcells)
- **Linear constructions** (roads, railways, embankments, bridges, irrigation canals, etc.)
- Fallow lands, unmanaged sites


ASCL_SYR


BIDE_FRO

Spreading routes, infection sources V.

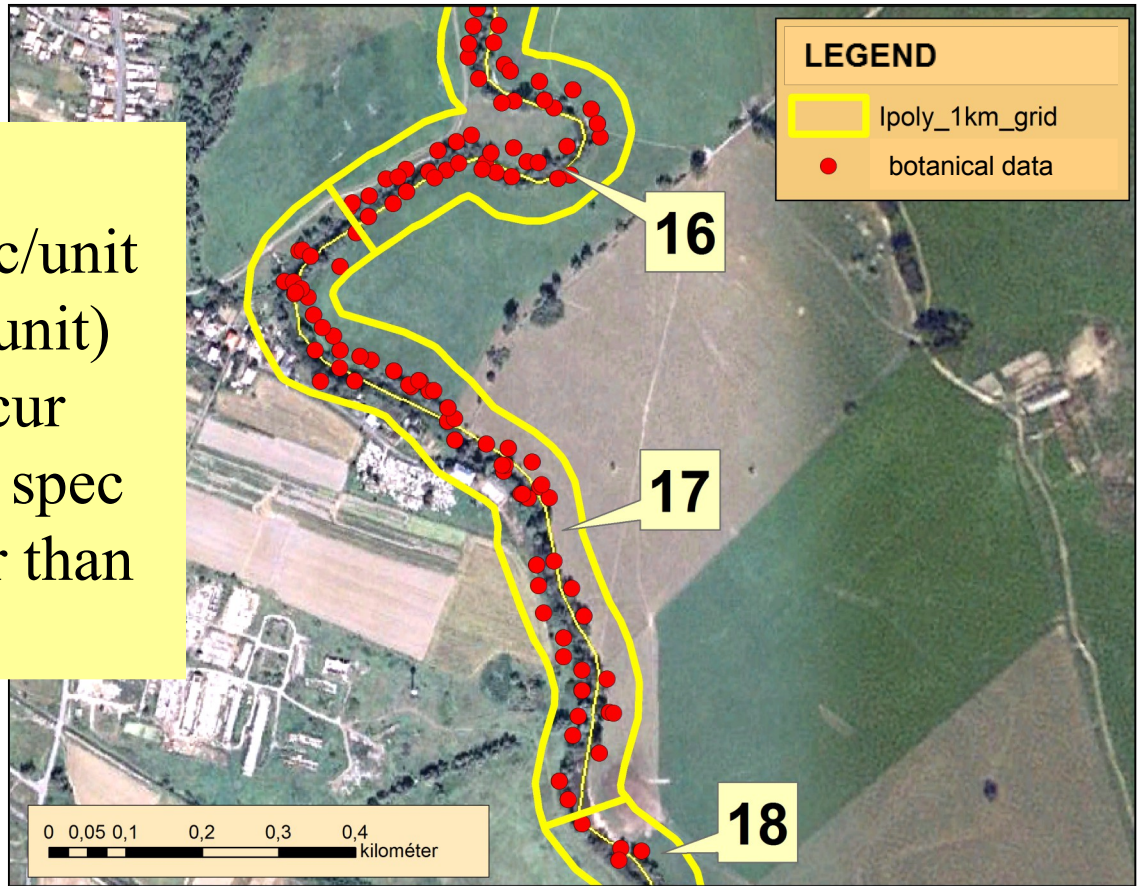
- The Ipoly river continues to extend the invasive species propagules (esp. hydrochoric species)
- The outfall of water inflow (brooks) from the hilly areas deliver large amounts of invasive plant propagules
- The role of the settlements are very important secondary infection localities (e.g. abandoned parcells)
- Linear constructions (roads, railways, embankments, bridges, irrigation canals, etc.)
- **Fallow lands**, unmanaged sites


ROBI_PSE
ASTE_LAN

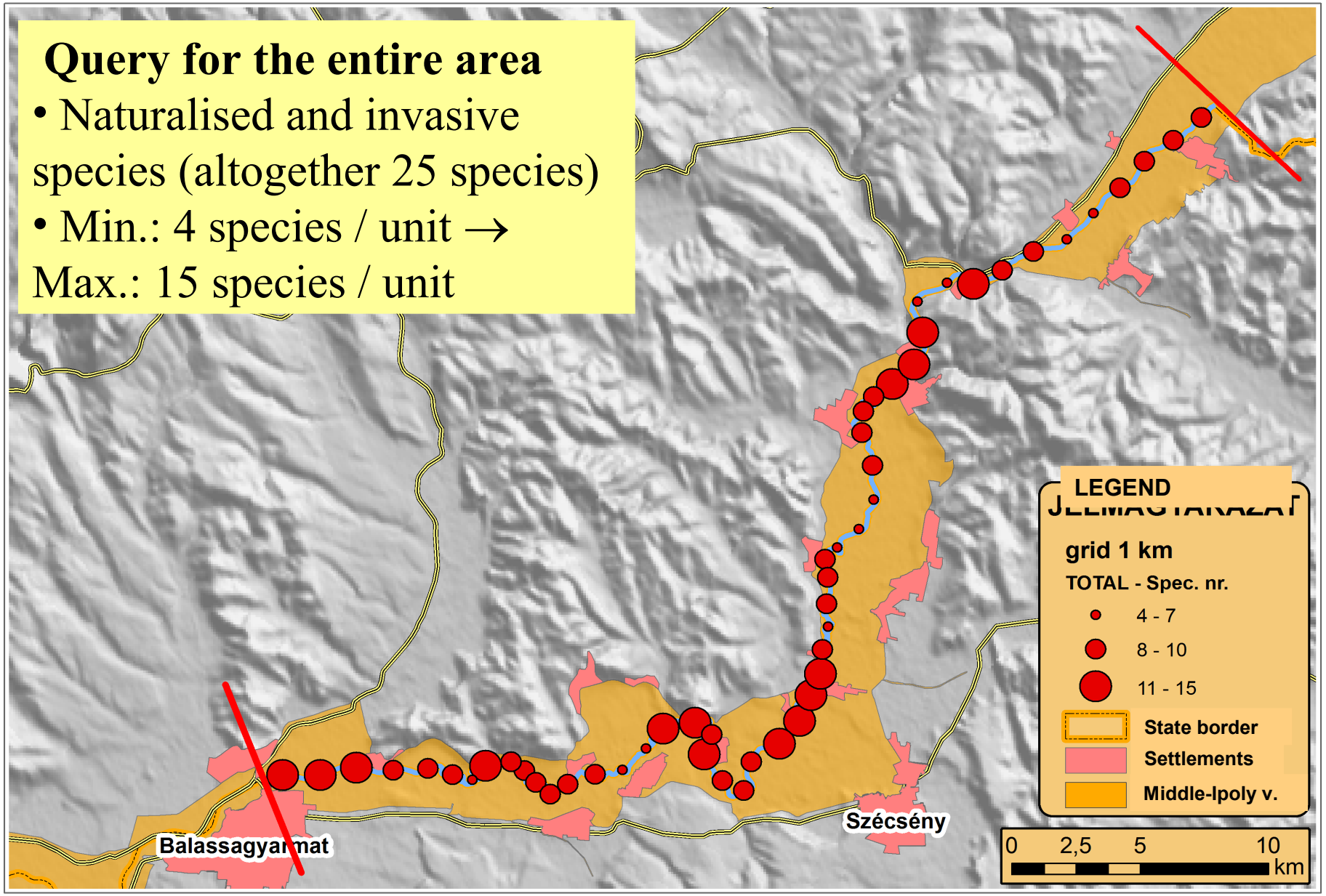
Evaluation in community level

• 20 m broad riverside was studied (query is only for naturalised & invasive species)
• Using GIS technologies we generated 53 units (each 1 km long and 50 metres wide) – „ALL”, „HU”, „SK”

Results
• HU: 4,7 INV spec/unit SK: 8,3 INV spec/unit)
• Only one unit occur where the SK INV spec number was higher than HU (Unit nr. 27.)



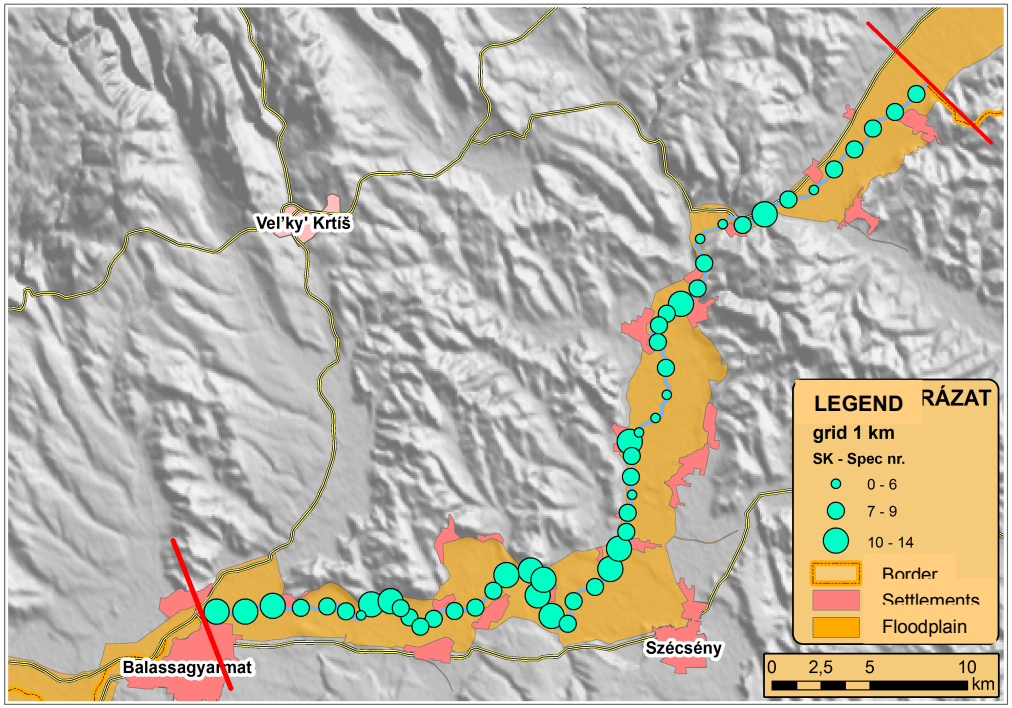
Evaluation in community level - „ALL”



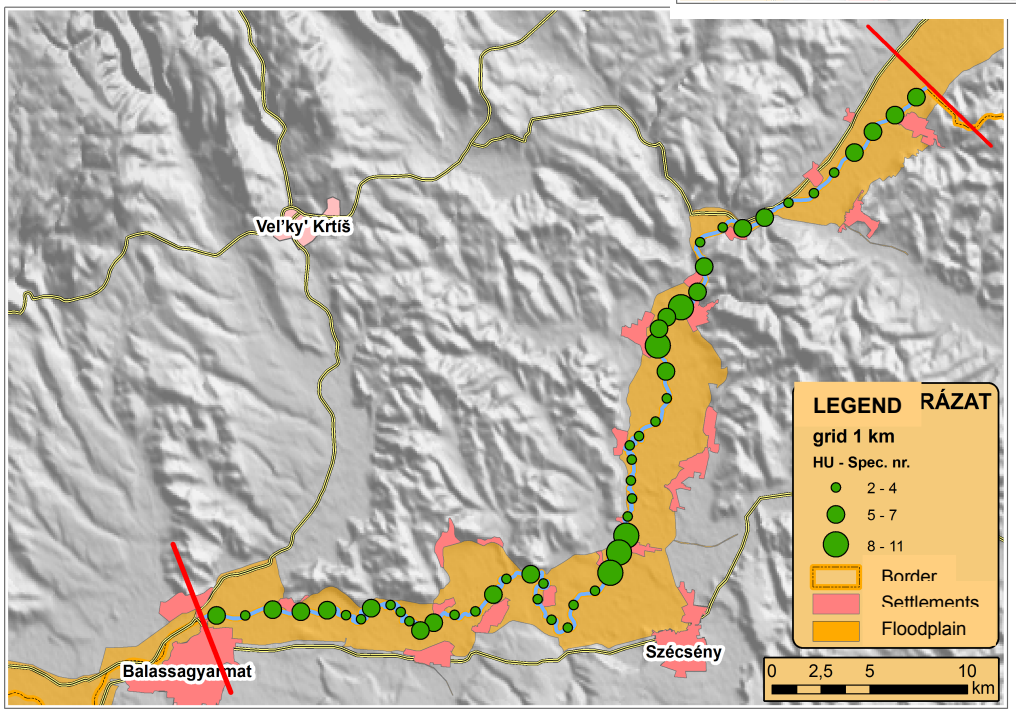
Query for countries

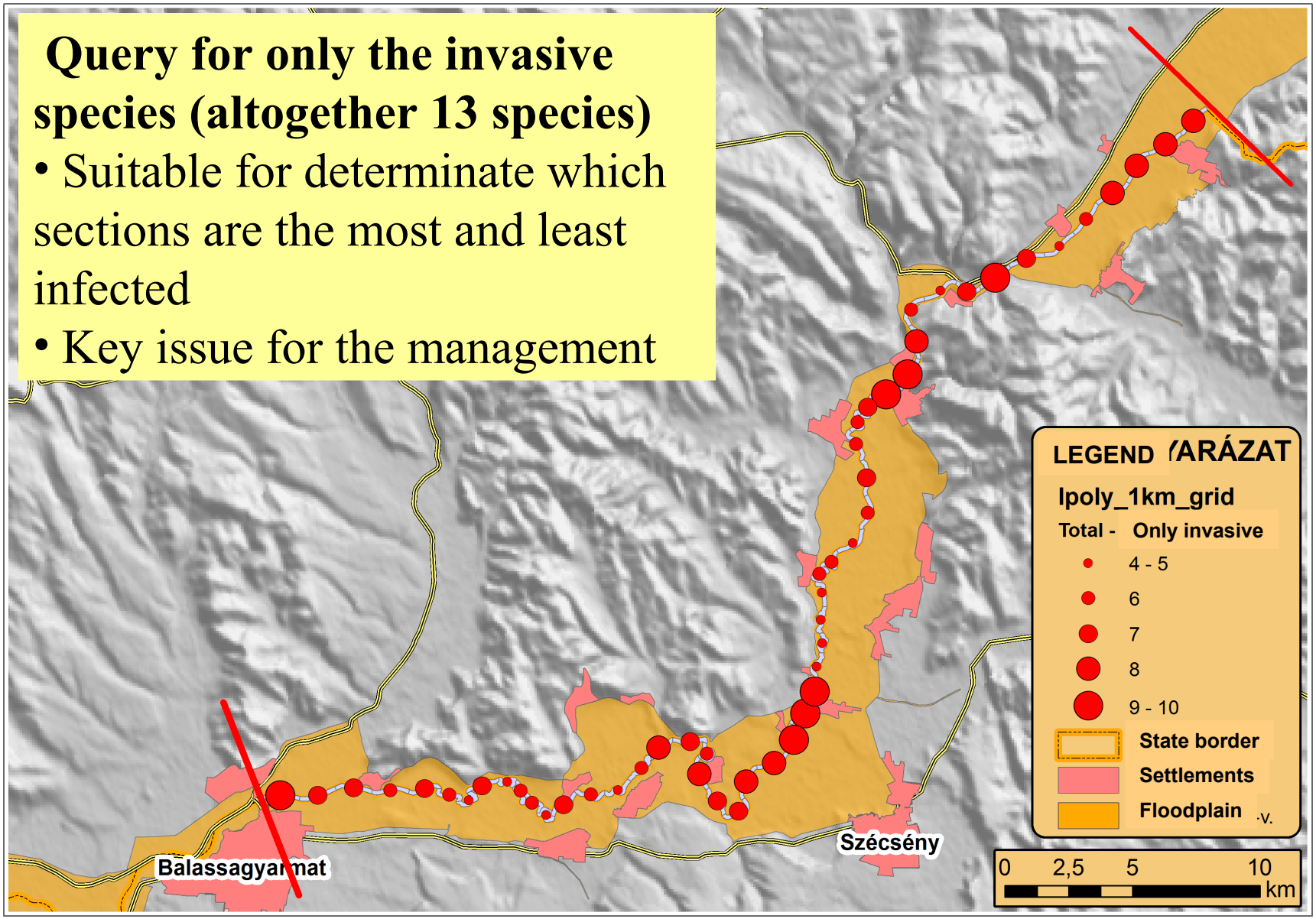
- Significant differencies occur (HU-SK)

SK

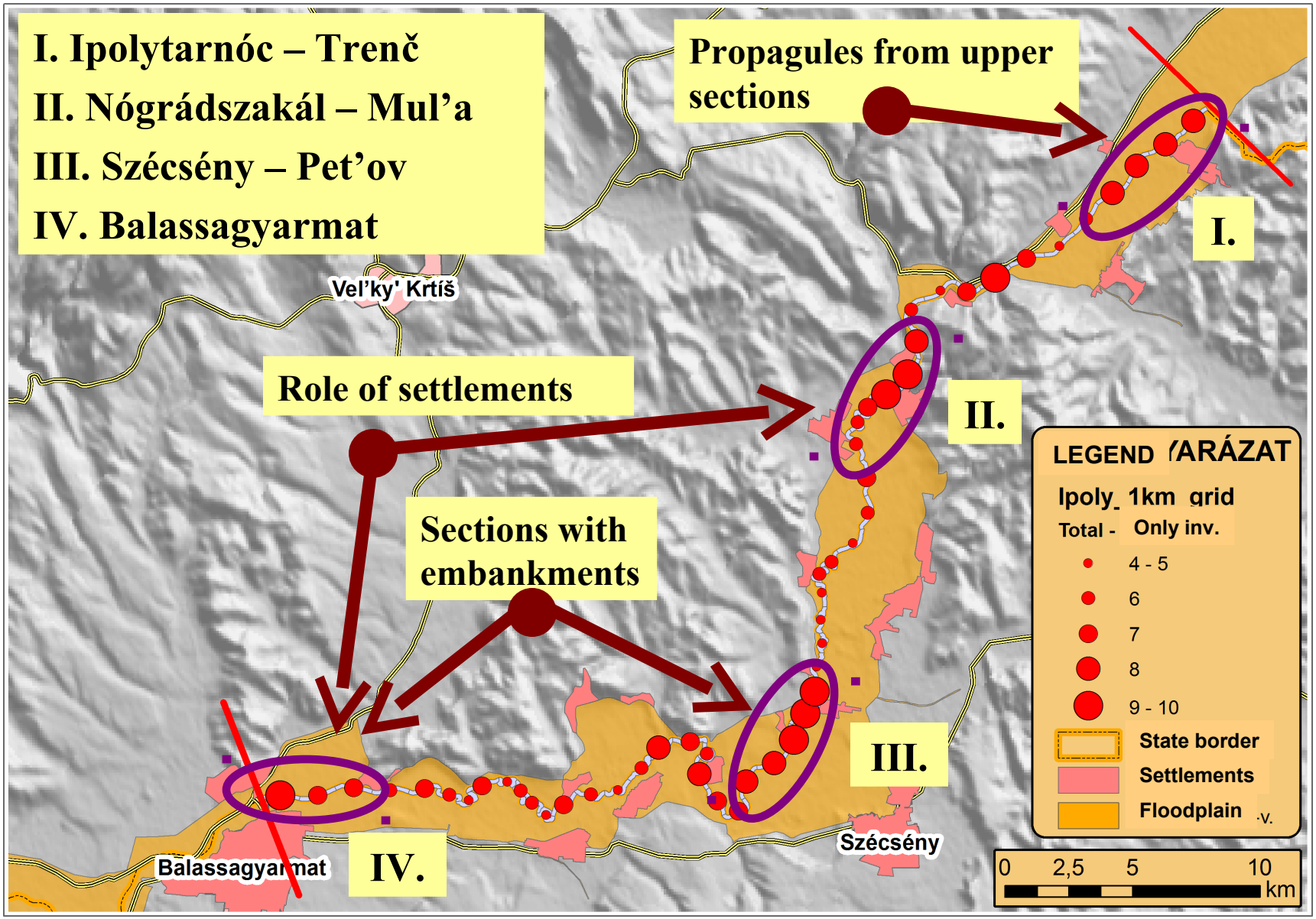


HU

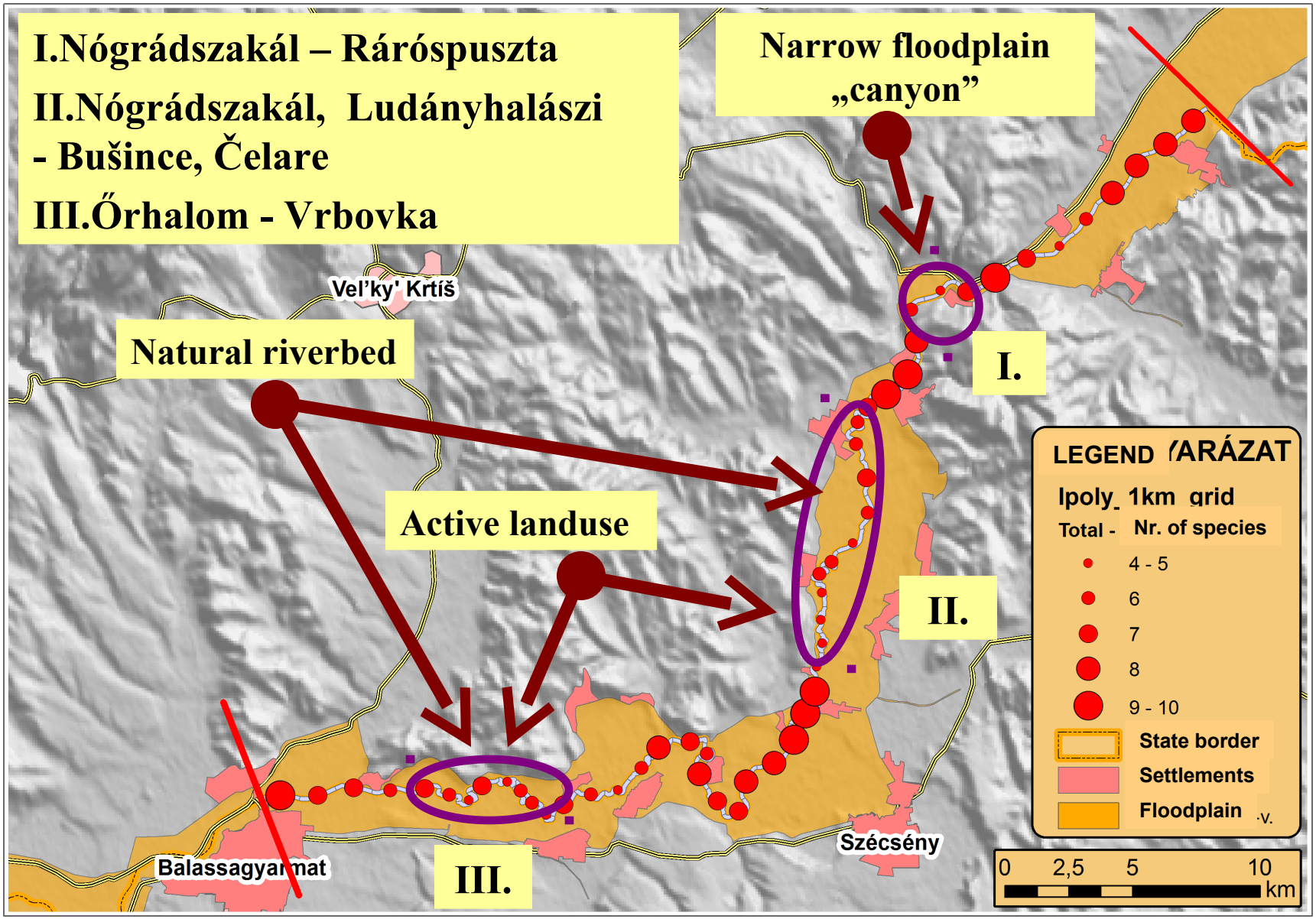



Query for only the invasive species (altogether 13 species)
• Suitable for determinate which sections are the most and least infected
• Key issue for the management
LEGEND
lpoly_1km_grid
Total - Only invasive
4 - 5
6
7
8
9 - 10
State border
Settlements
Floodplain
0 2,5 5 10
km
Balassagyarmat
Szécsény

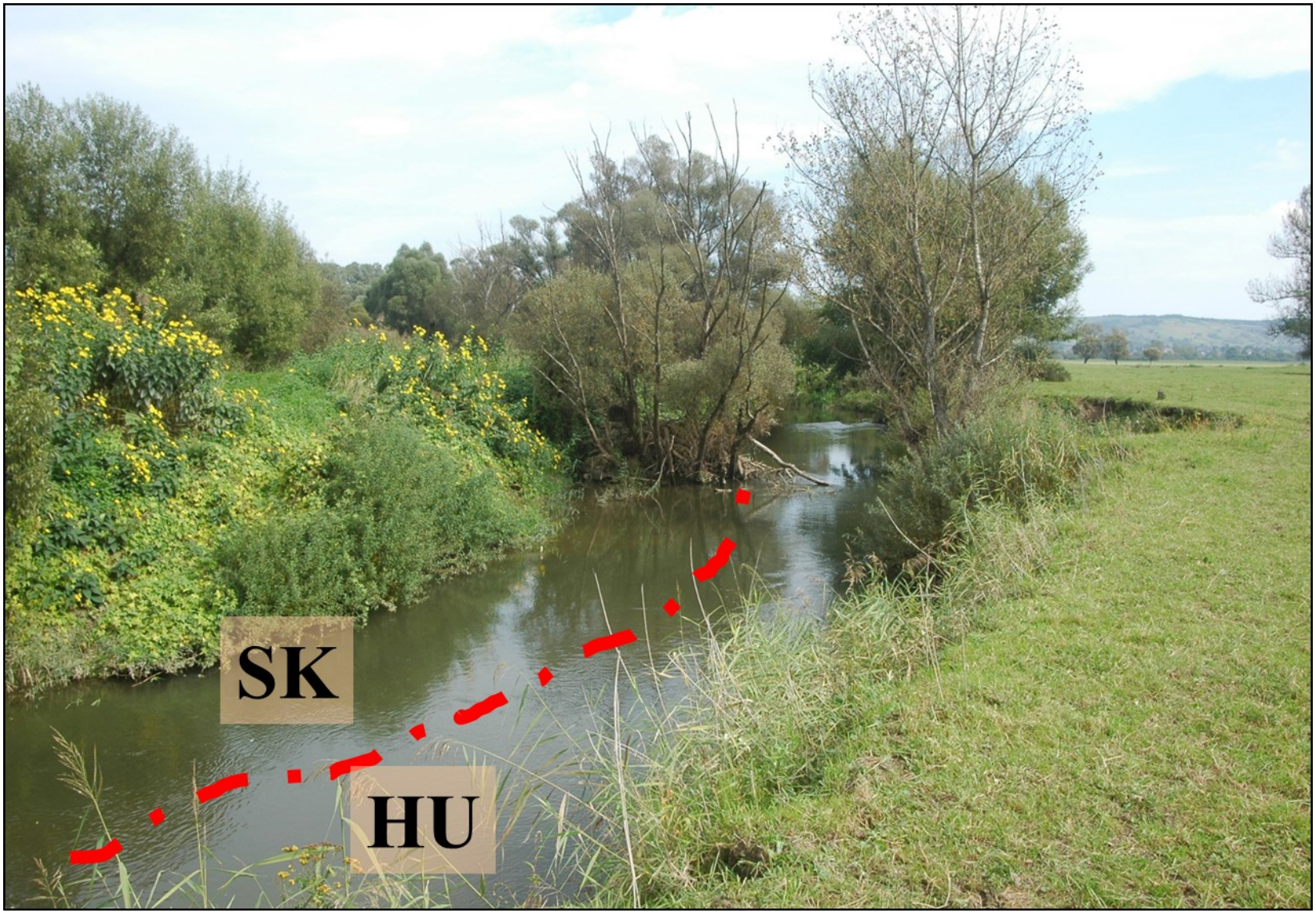
The most infected sections



The least infected sections



„Let us manage or not?”



Thank You for the attention!

Naturregio floodplains

Alfred Toepfer Stiftung F.V.S.

DBU Deutsche Bundesstiftung Umwelt

Michael Otto Stiftung