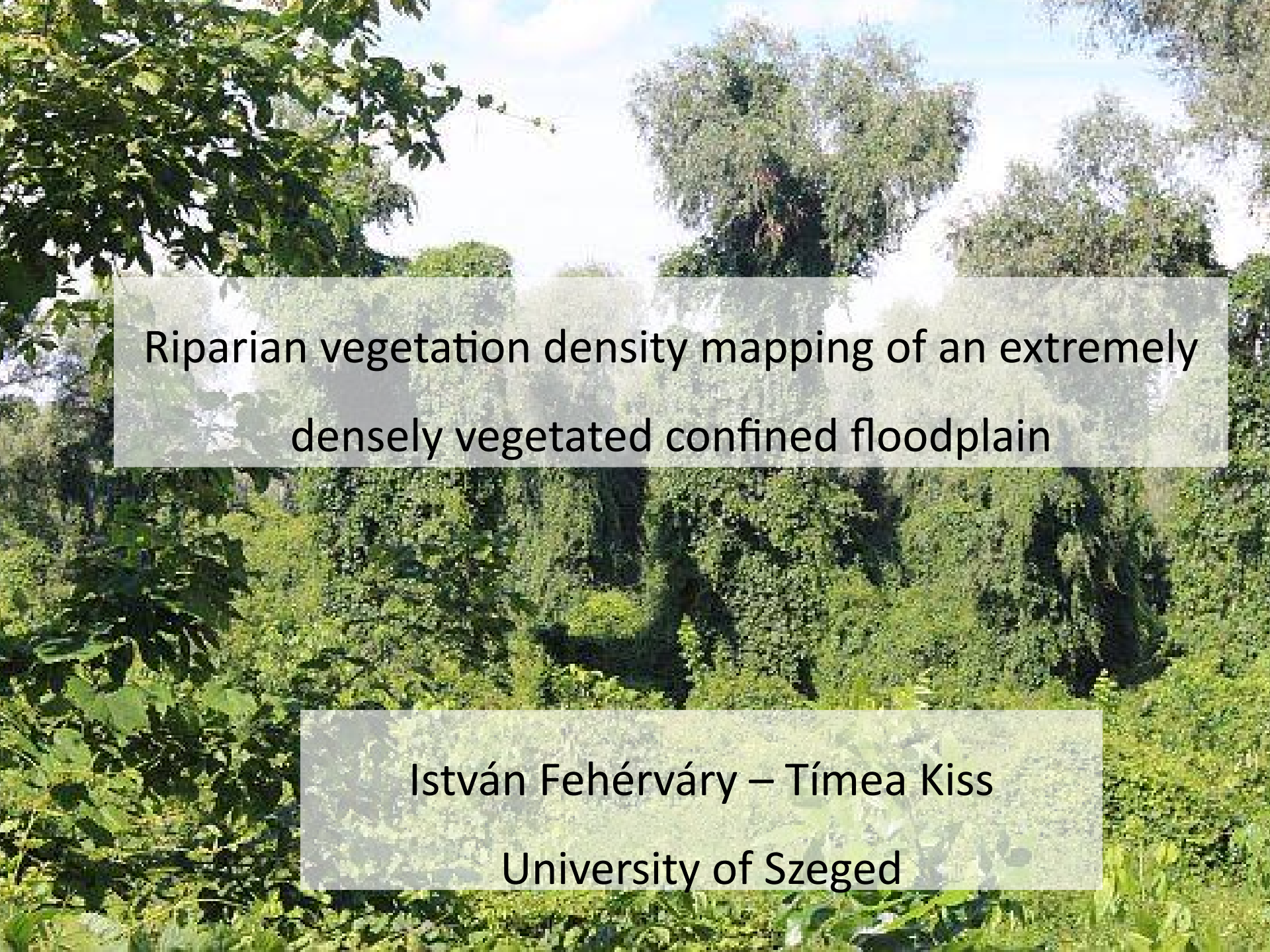

Riparian vegetation density mapping of an extremely densely vegetated confined floodplain

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Problem statement



human impact and spread of invasive species

→ accelerate changes in floodplains and rivers

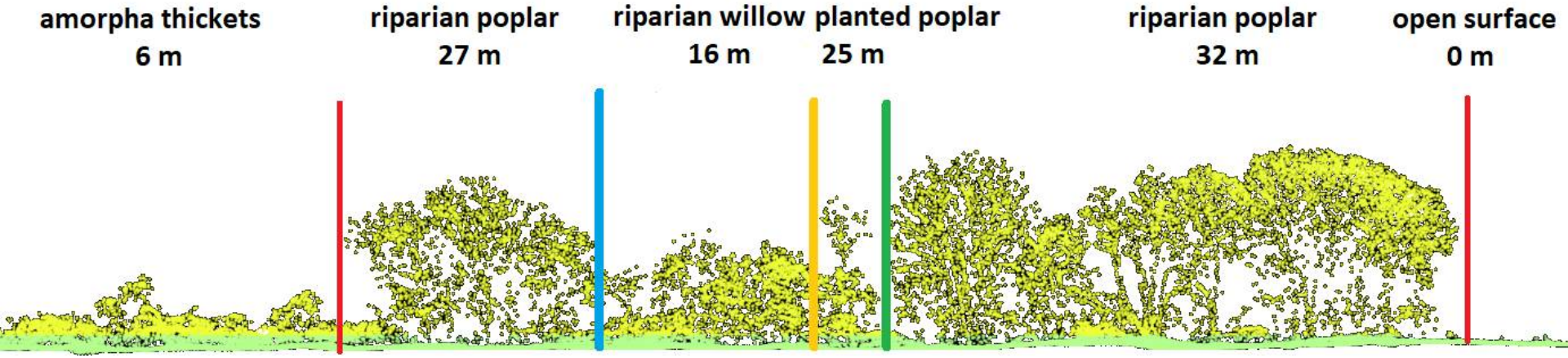
→ management of the riparian vegetation is crucial

← dense stands of invasive species (e.g. like *Amorpha*) increase flood levels and decrease biodiversity

Research aims

1. *Identify vegetation classes*
2. *Determine understorey vegetation density*
3. *Flow modelling of various riparian vegetation patterns*

To support hydrological modelling and proper flood management

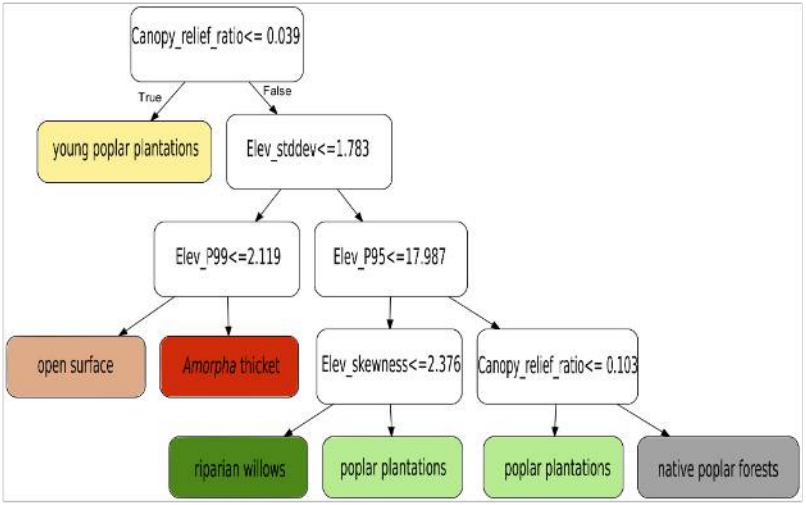


1. *Identification of vegetation classes*

Data: LiDAR survey (2015)

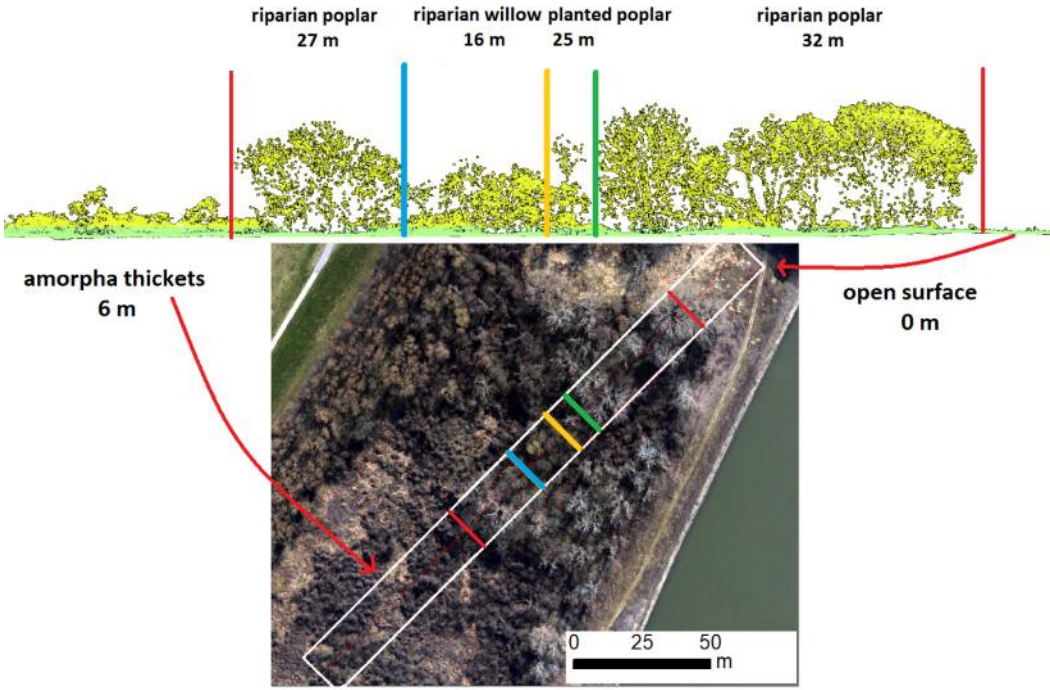
Training plots: 15x15 m (voxels)
→ statistical parameters of their LiDAR point clouds

were determined.
→automatized parameter selection
→ the most suitable decision tree was selected.



Entire study area:
vegetation types were determined

- *Riparian poplar forest (Populus alba)*
- *Planted poplar (young and mature)*
- *Riparian willow forest*
- *Amorpha thicket*
- *Open surfaces*



1. Identification of vegetation classes

Validation:

Based on field work	Based on decision tree: *open surface*	*riparian willow*	*Amorpha thicket*	*riparian poplar forest*	*young poplar plantation*	*poplar plantation*
open surface	0.75	0.00	0.08	0.00	0.17	0.00
riparian willow	0.00	0.84	0.05	0.05	0.00	0.05
Amorpha thicket	0.00	0.08	0.92	0.00	0.00	0.00
riparian poplar forest	0.00	0.00	0.00	0.83	0.08	0.08
young poplar plantation	0.00	0.00	0.17	0.00	0.83	0.00
poplar plantation	0.00	0.00	0.00	0.18	0.00	0.82

field survey with drone photos

the accuracy on average: 83%

2. *Calculation of vegetation density based on airborne LiDAR survey*

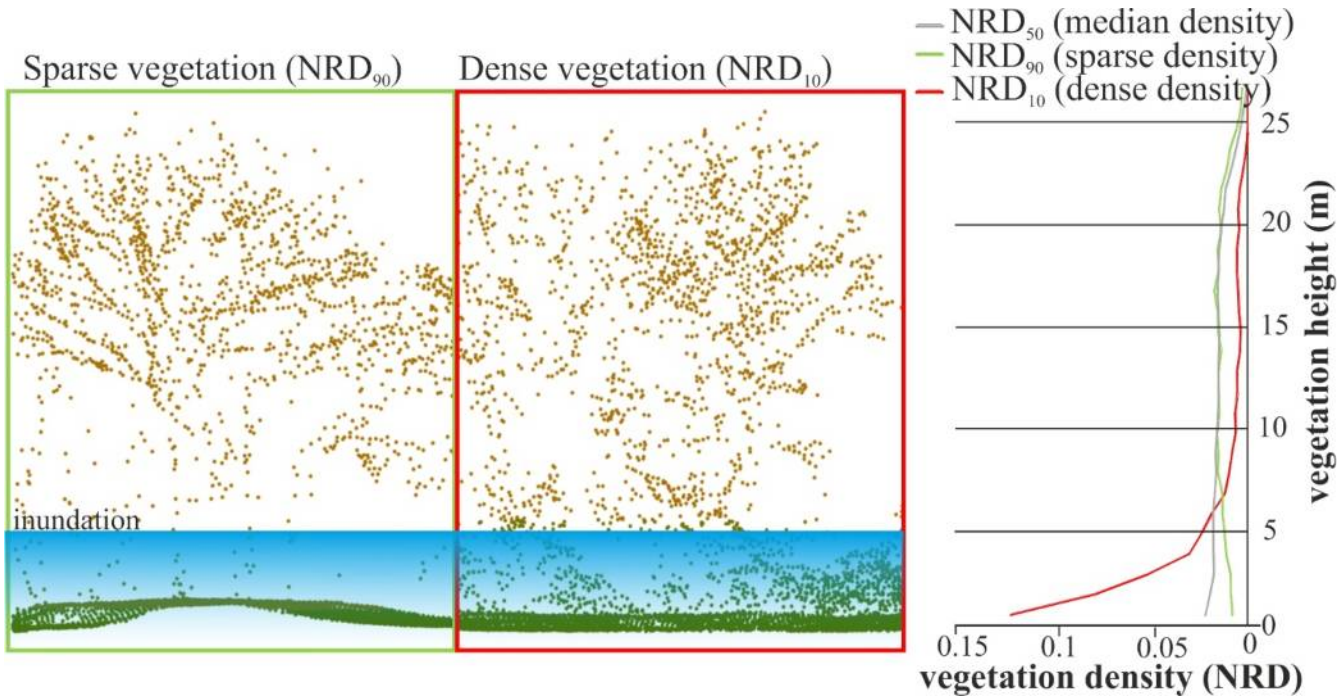
Vegetation density

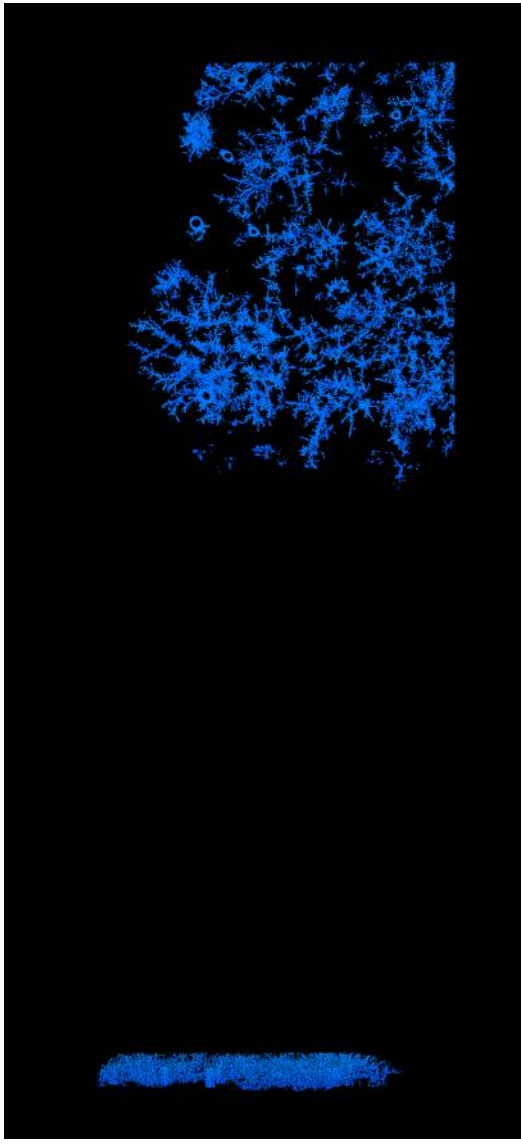
of the flooded (1-5 m height) vegetation zone

based on reflectance ratios:

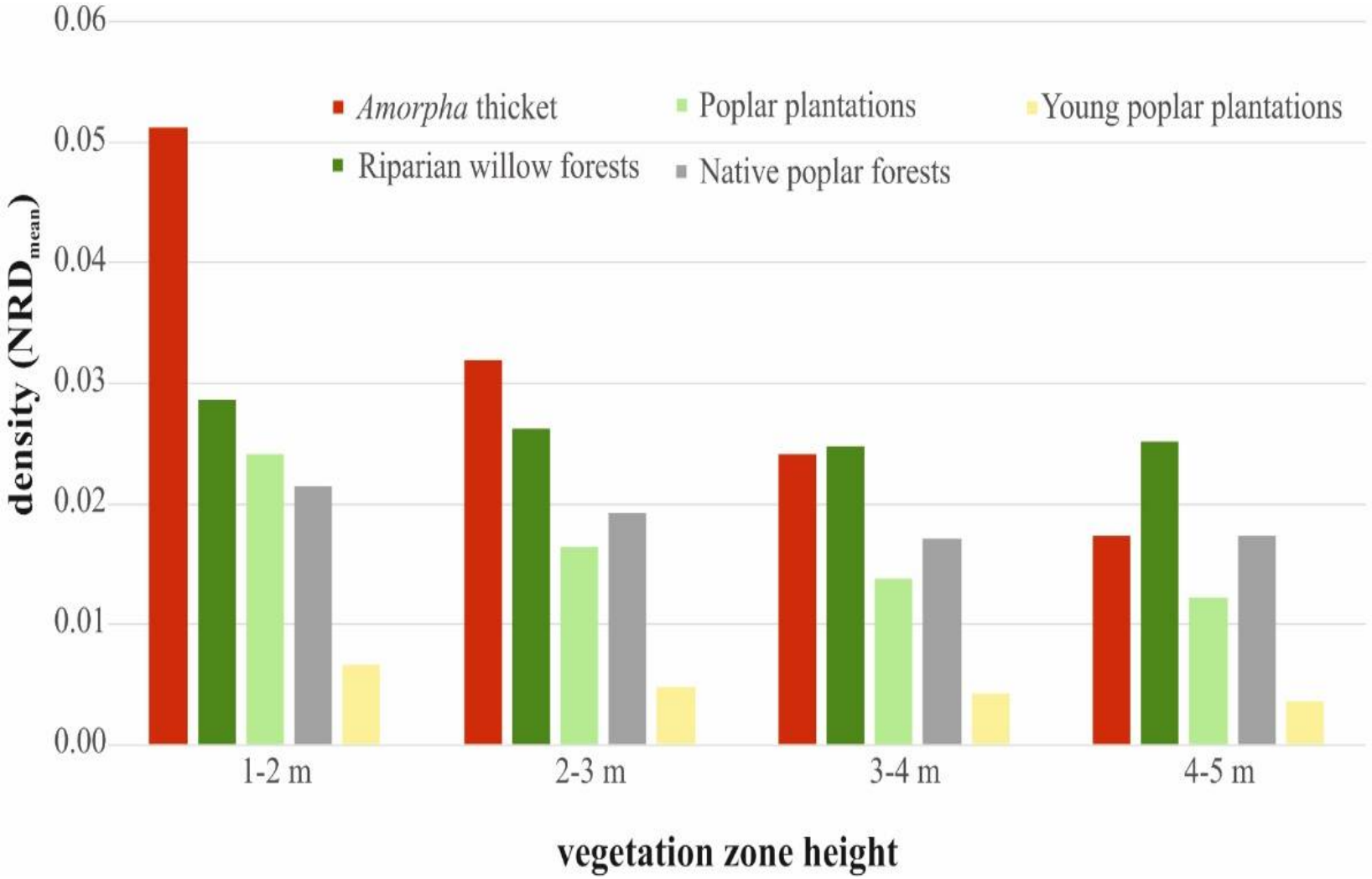
NRD: normalized relative point density

NRD (i,j) = =





2. Calculation of vegetation density based on airborne LiDAR survey

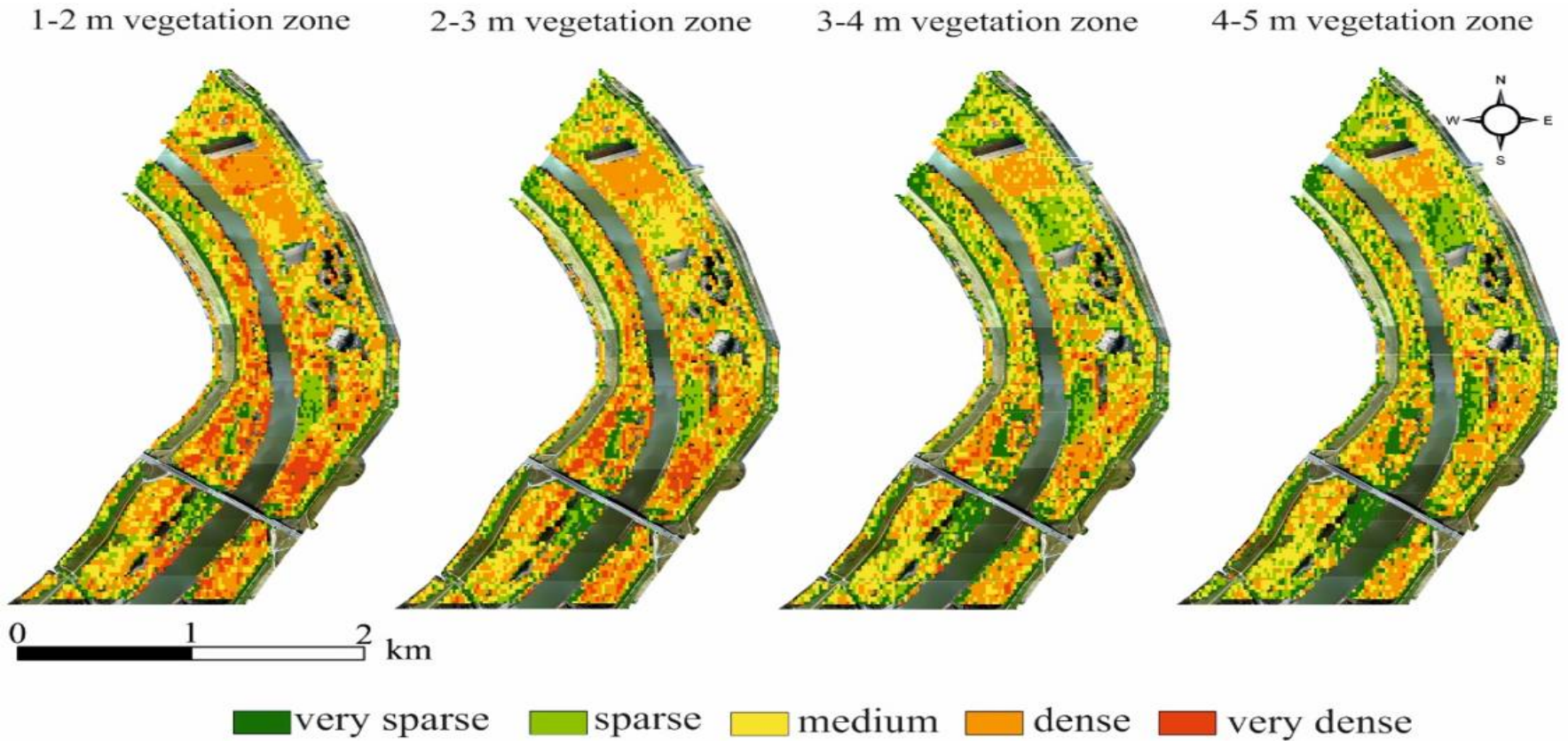


2. Calculation of vegetation density based on airborne LiDAR survey

5 vegetation classes (based on distribution curves)

→ the location of the densest plots could be identified

→ suggestion for management

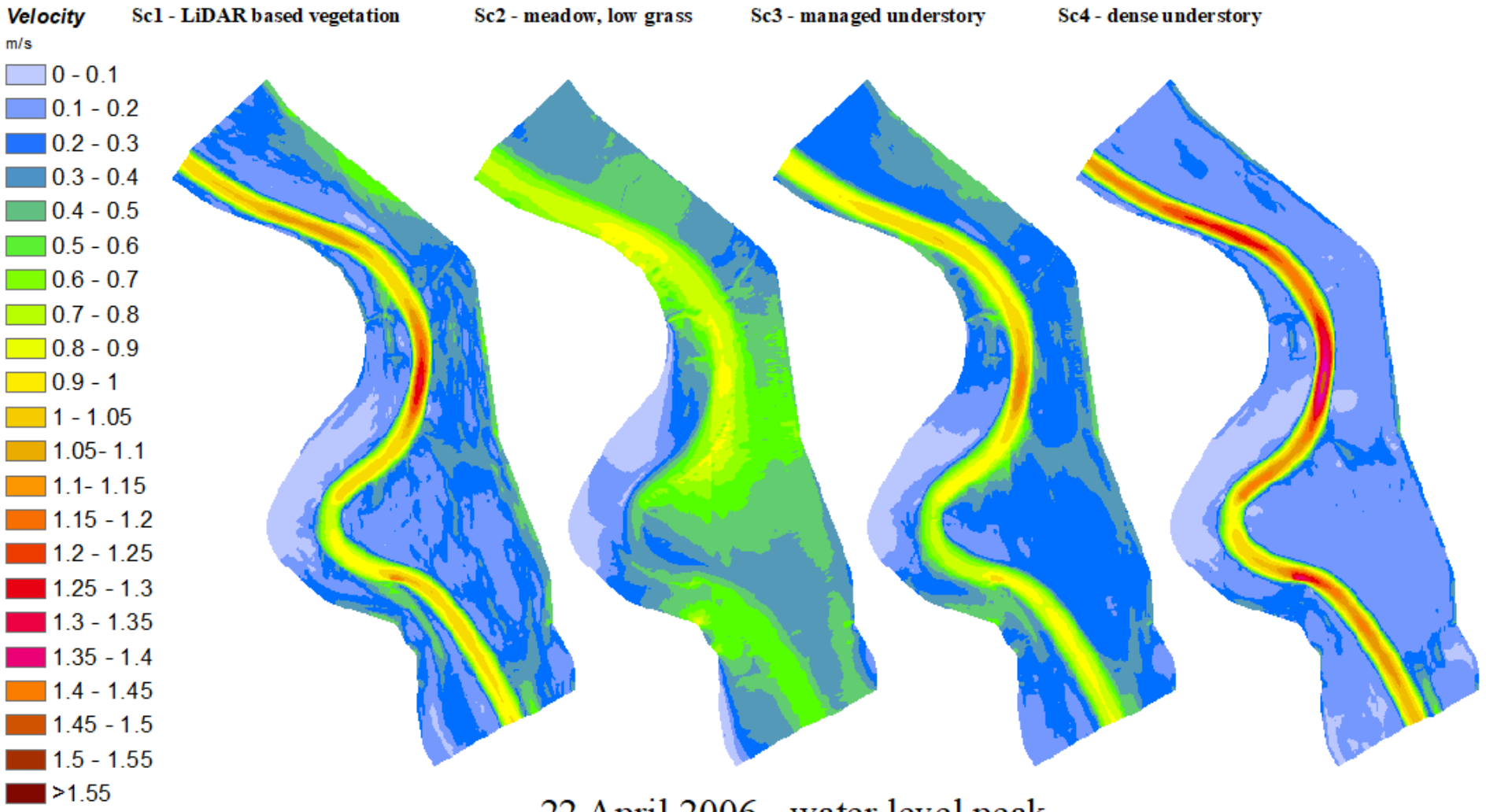


3. Modelling of floods under various management practices

Model: Hec-RAS 2D

Manning's roughness: based on vegetation density classes

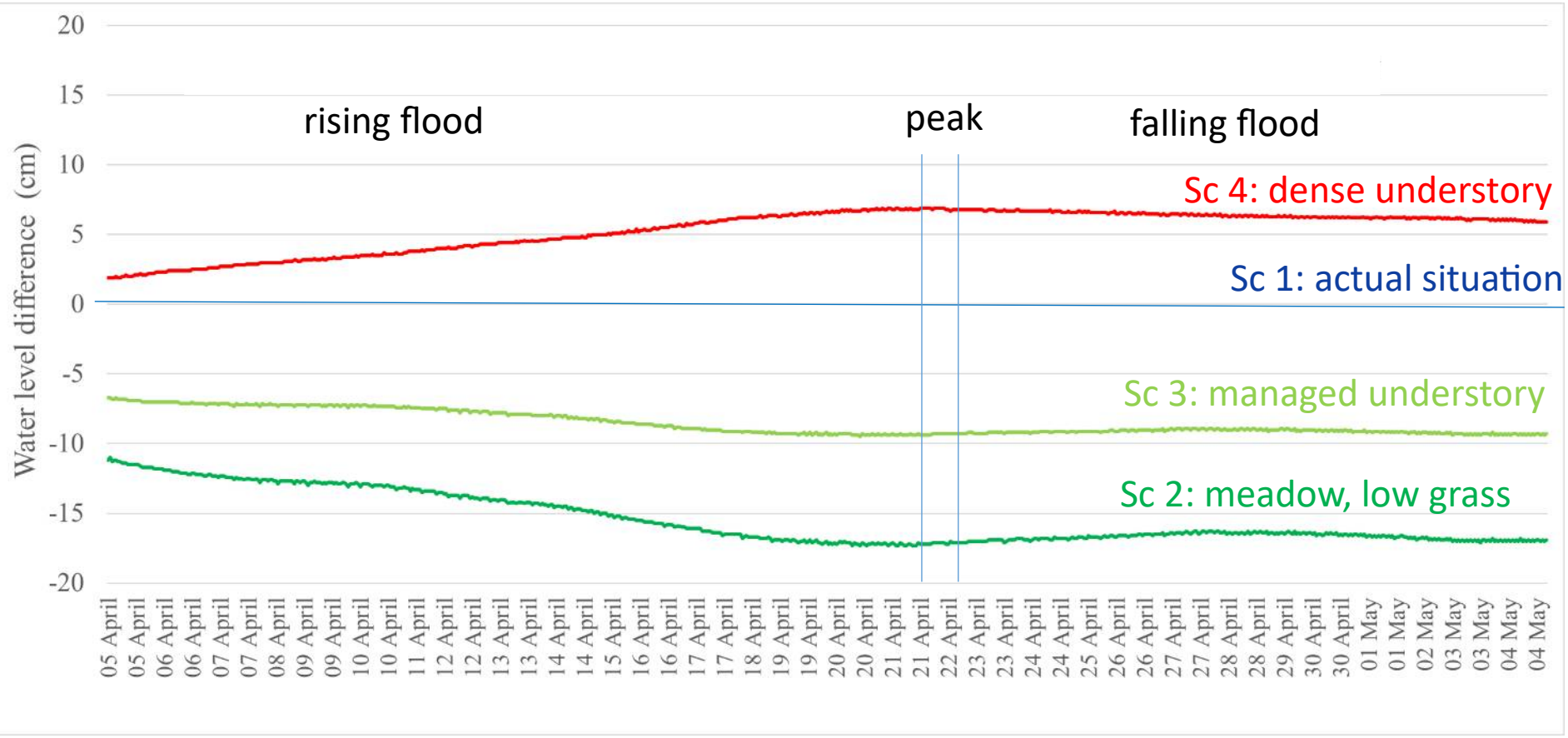
Various scenarios - flow conditions



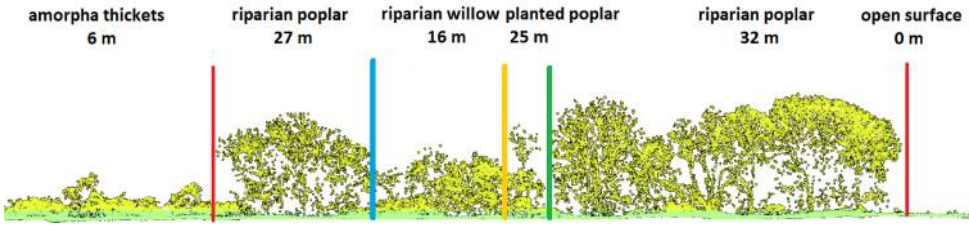
22 April 2006 - water level peak

3. Modelling of floods under various management practices

Various scenarios – flod level change



Take-home messages

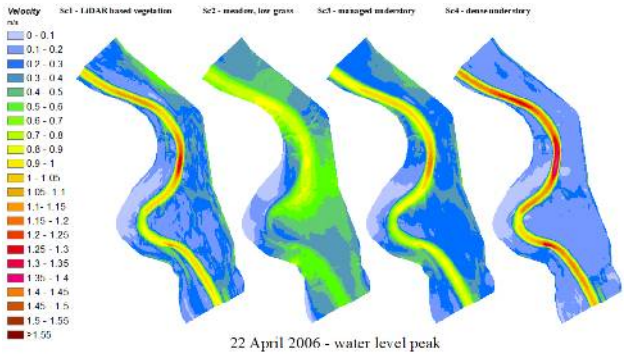


Based on airborne LiDAR data it is possible to calculate various parameters of the riparian vegetation (height, canopy roughness, undersorey density etc.) over large floodplain areas.

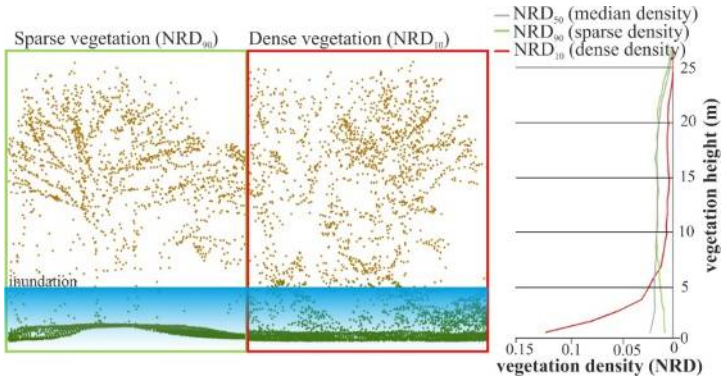
Appliying machine learning alorythms, these data could be used to classify and identify (riparian)vegetation types.

The density of riparian vegetation could be calculated precisely, and it could be used as an input parameter for hydrological modelling.

Various vegetation patterns could be used in 2D hydrological modelling to estimate the hydrological consequences of vegetation management plans.



22 April 2006 - water level peak




Thank you for your attention