SOIL AS INDICATOR OF FLOOD PROTECTION – A CROSS-BORDER CASE STUDY IN MORAVA FLOOD PLAIN - SLOVAKIA

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VÚPOP

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Soil - water interactions

- **The premise:** fluvial sediments may register each flood event in the last 1000 years and in the soil profile in these sediments are well diagnosed.
- In Morava river were registered last major floods in**1996, 2002, 2006, 2010**.
- Identifying of such areas could be recognized on the basis of soil units mapping and classification (Fluvisols and Gleysols)

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WP3 goals

- Elaboration of **risk maps** for cross-border regions which can indentify areas threatened by floods
- The actions was focused on **training opportunities** to control and prevent of flood natural hazards and protection.
- As **target groups** will address mainly residents of municipalities, local governments and regional associations, voluntary organizations with priority protection areas (fire and rescue organizations, etc.)

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WP3: Soil–water interaction

- Selection of the **target area**
- Providing **documentation materials** (data, maps for the cross-border target area)
- **Jointed methodology and approaches** in terms of soil maps
- Target area definition
- **Hydrological model** approaches and verification
- Voluntary organizations (next actions)
- Transmissions of results (on other regions)

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Selection of the target area

- **Záhorská Ves – Angern an der March**

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Providing documentation materials in Slovakia

- Soil types and subtypes maps (1:5,000)
- Soil-ecological units maps (1:5,000)
- Remote sensing maps (orthophoto maps) and satellite images for flooding events identification
- Land use map (1:5,000)
- Digital terrain map (DTM) (1:5,000)
- Flooding zones according to modelled hydrophysical data
- Soil water retention capacity map

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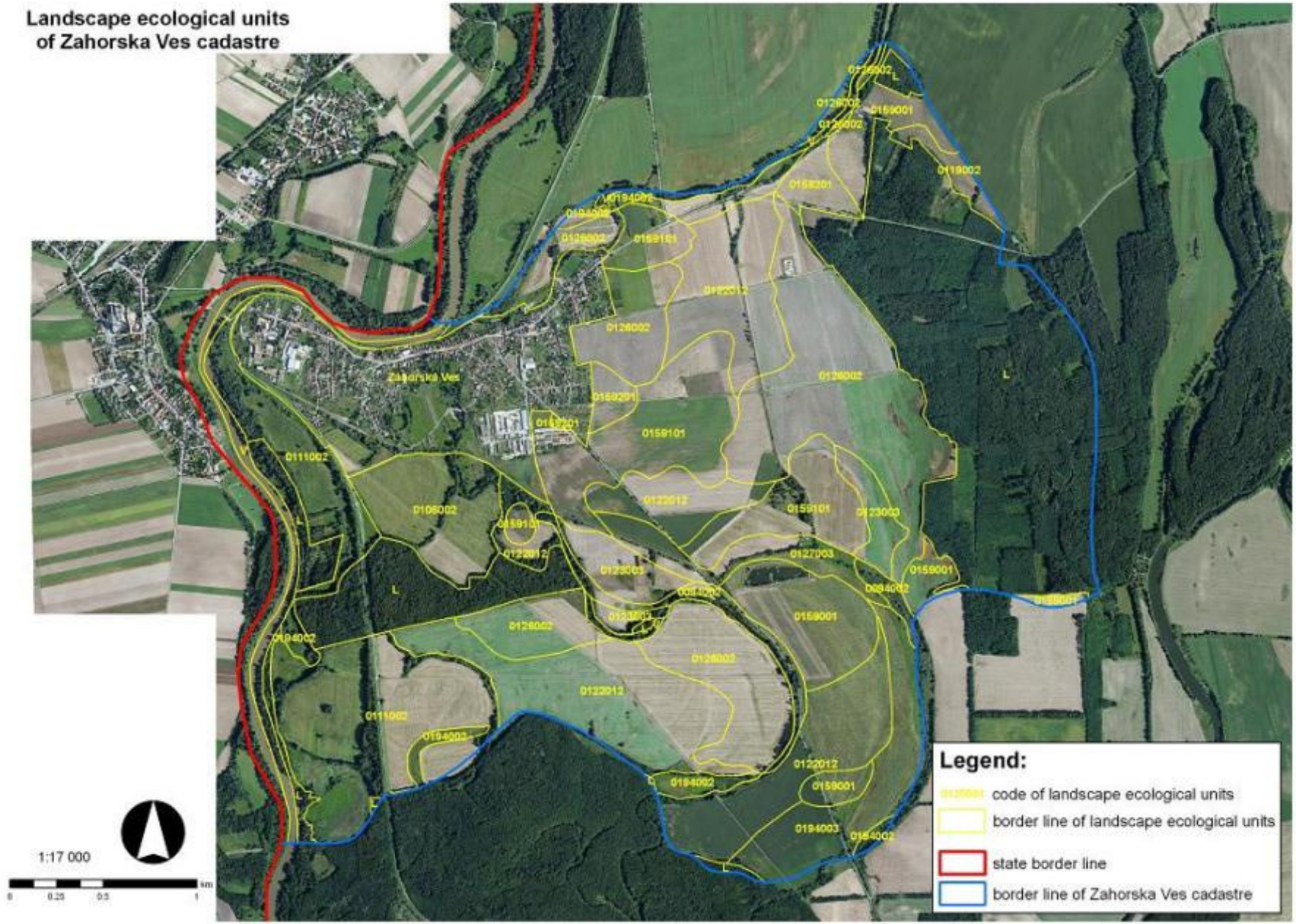
Landscape ecological units of Zahorska Ves cadastre



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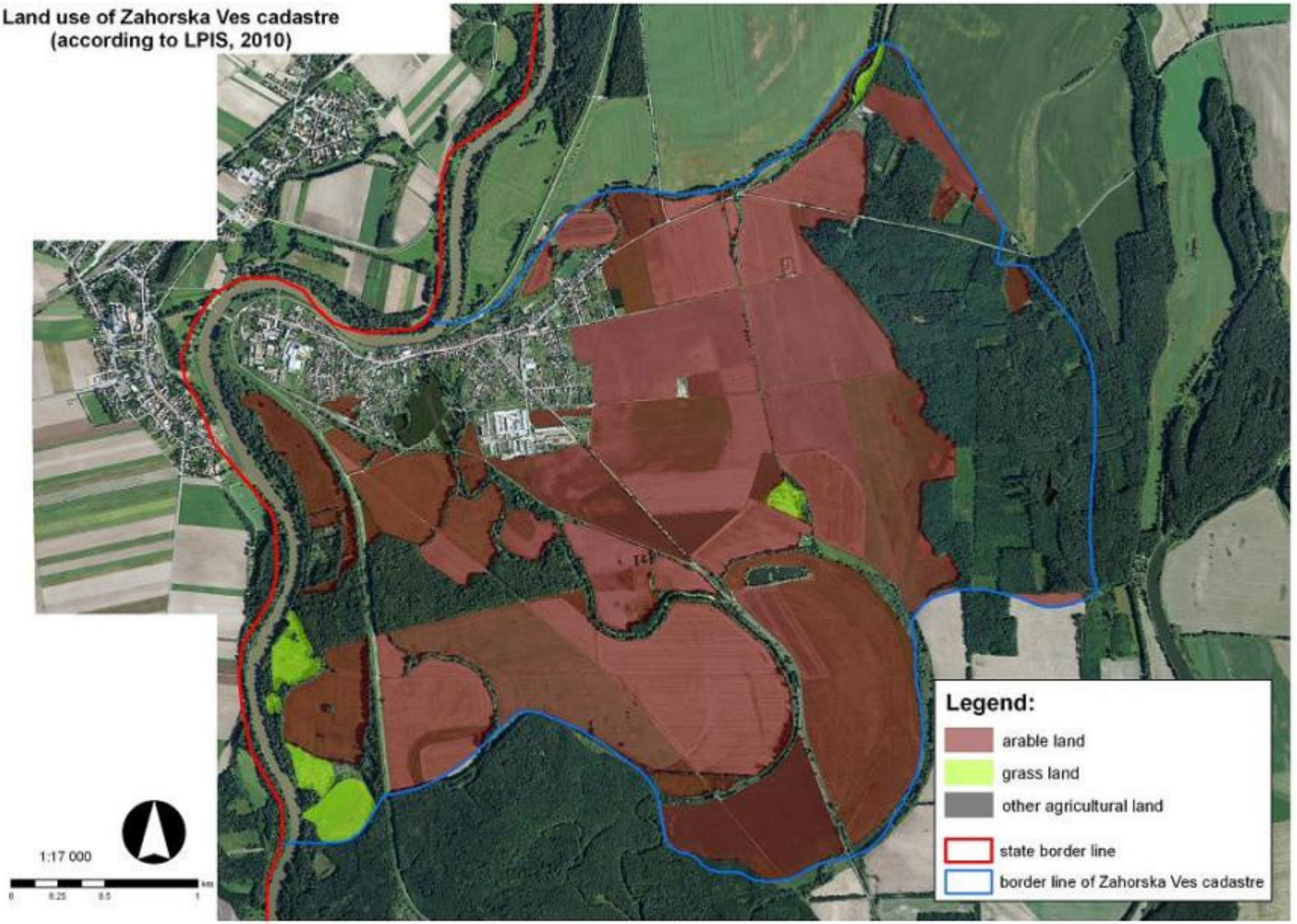
Land use of Zahorska Ves cadastre (according to LPIS, 2010)



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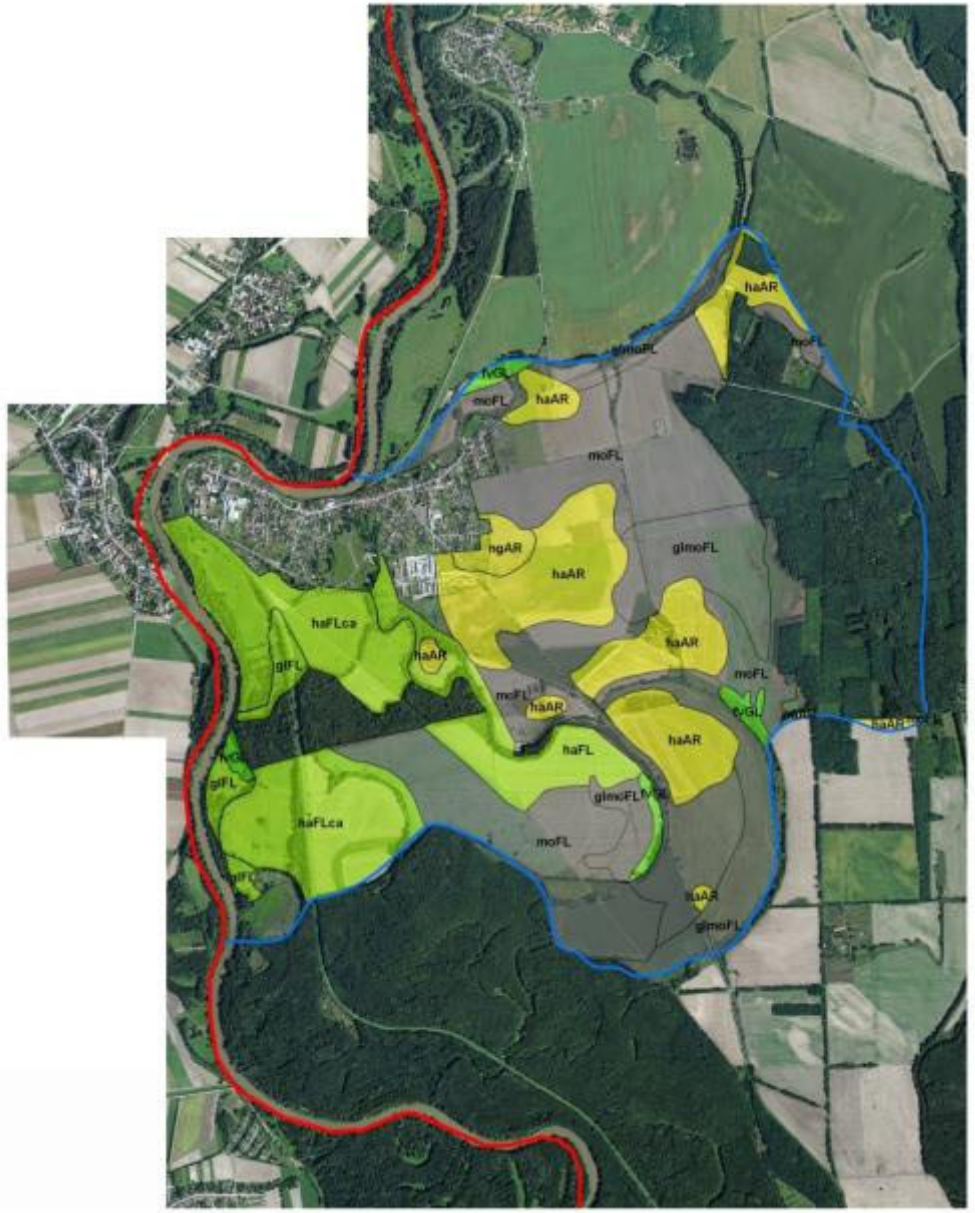
Soil types and soil subtypes of Zahorska Ves cadastre



Legend:

according to:
World Reference Base
for Soil Resources, 2006
(updated version 2007)

- haFL — Haplic Fluvisol
- haFLca — Haplic Fluvisol Calcaric
- glFL — Gleyic Fluvisol
- moFL — Mollic Fluvisol
- glmoFL — Gleyic Mollic Fluvisol
- haAR — Haplic Arenosol
- ngAR — Endogleyic Arenosol
- fvGL — Fluvic Gleysol
- Non-agricultural land

- state border line
- border line of Zahorska Ves cadastre

1:25 000

0 0.5 1 2 km

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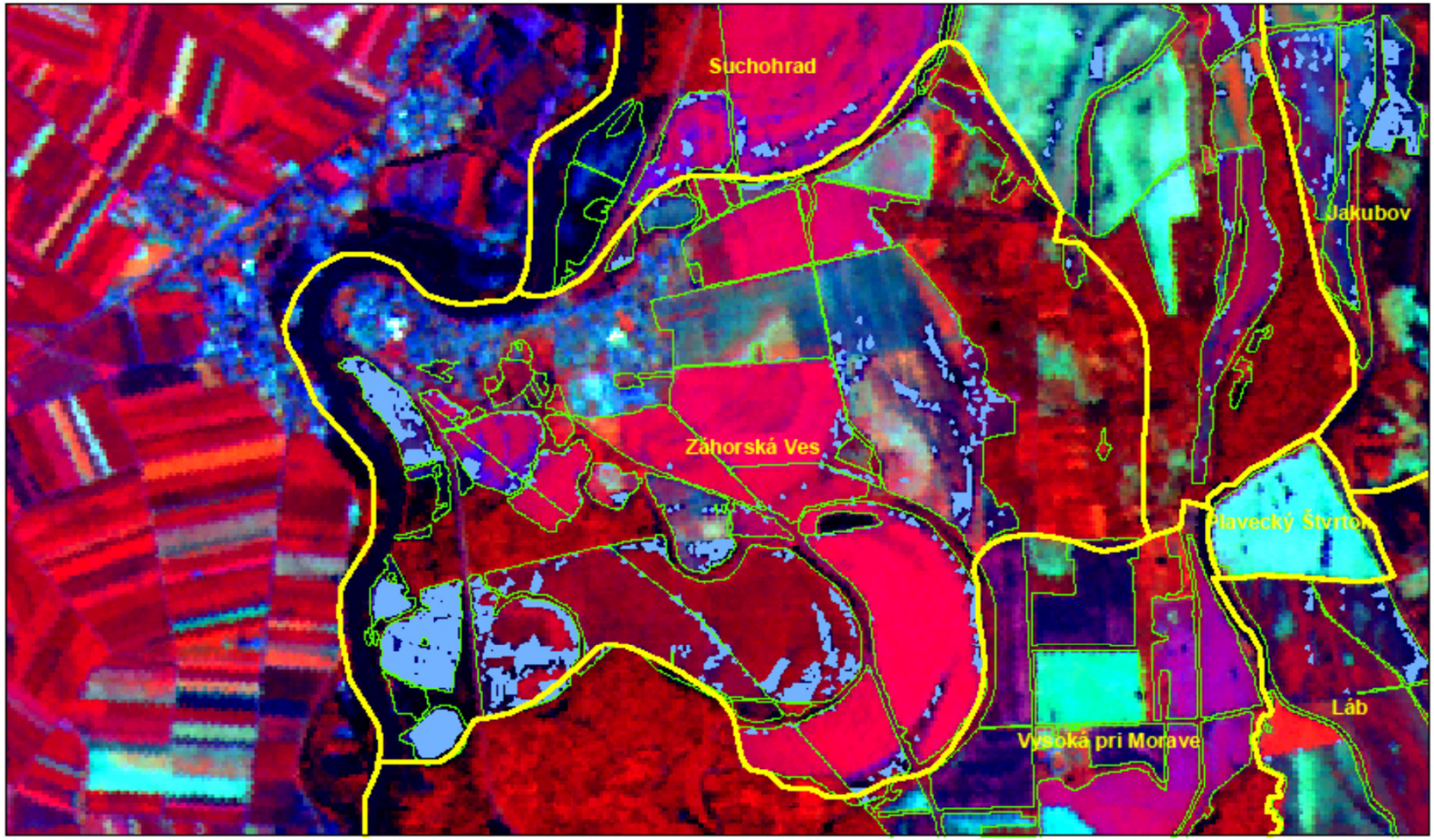
Flooding events in June 2010 (satellite)



Legenda

hranica obce
hranica kultúrneho dielu
zaplavené územie
irs-033-034_12-06-2010_ref-nn.img

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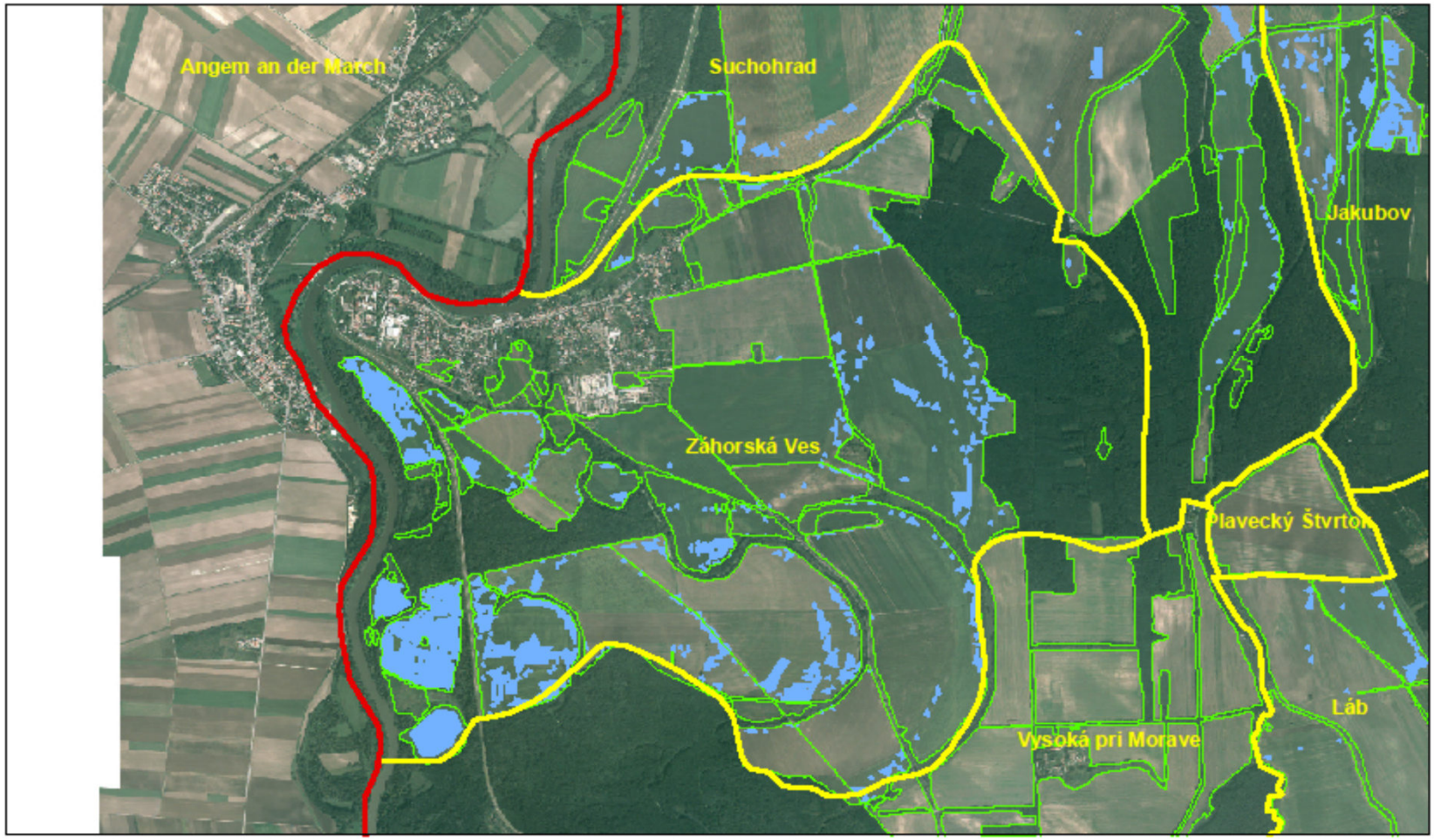

Legenda

- hranica SR
- hranica oboce
- hranica kultúrneho dielu
- zaplavené územie

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Jointed methodology and approaches in soil mapping

- **World Reference Base for Soil Resources** (2006, 2007) was used for the correlation soil types and soil texture in both countries, mainly hydromorphical soil types like Fluvisols and Gleysols.
- **Features of flood identification** could be: thin sedimentation layer on surface, stratification of layers, buried horizons presence, gleyic colour pattern and some redox mottling.
- The methodology was discussed like how to distinguish areas **under regular flooding without ground water affecting**, and proper flood identification within soil profile.

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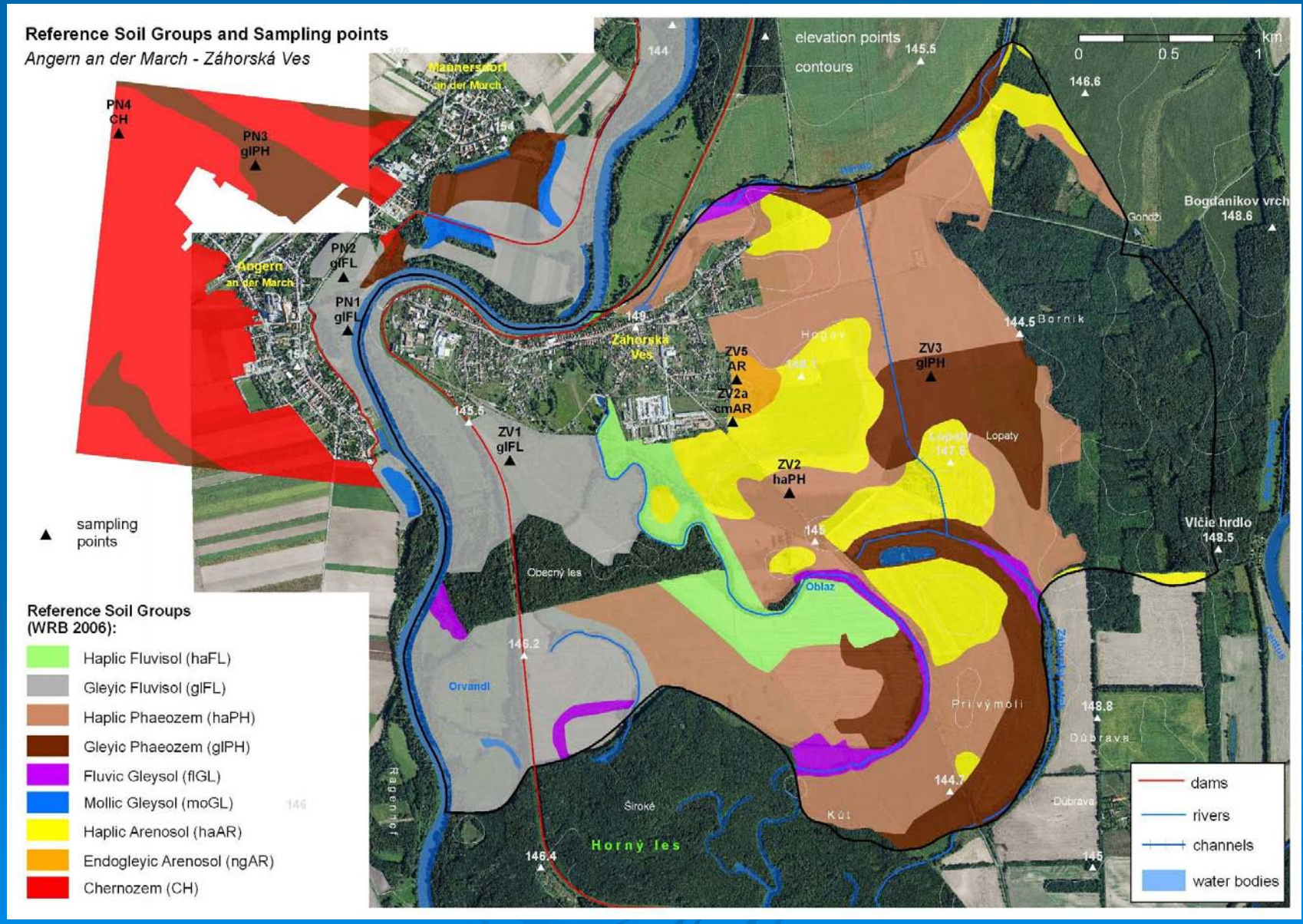
Common soil survey in the target area (19th of September 2011)



Soil sampling in the cross-border area

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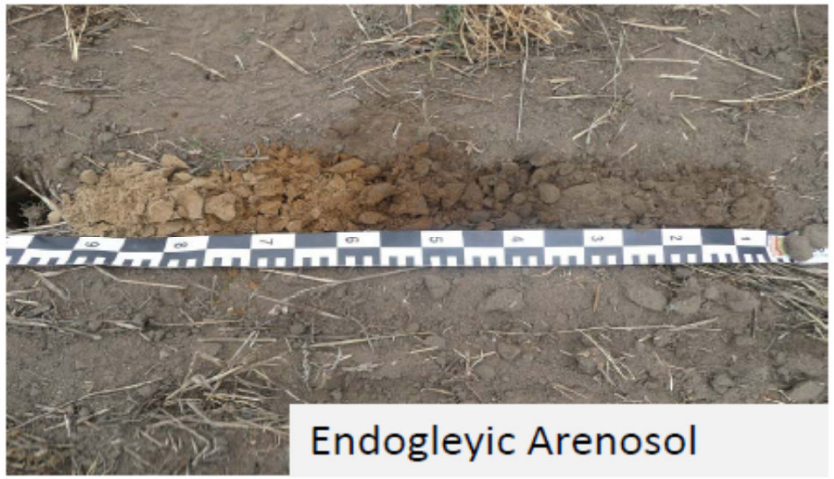
Soil survey in the Slovak part with 4 soil types identification

Haplic Phaeozem

Gleyic Fluvisol



Endogleyic Arenosol

Gleyic Phaeozem

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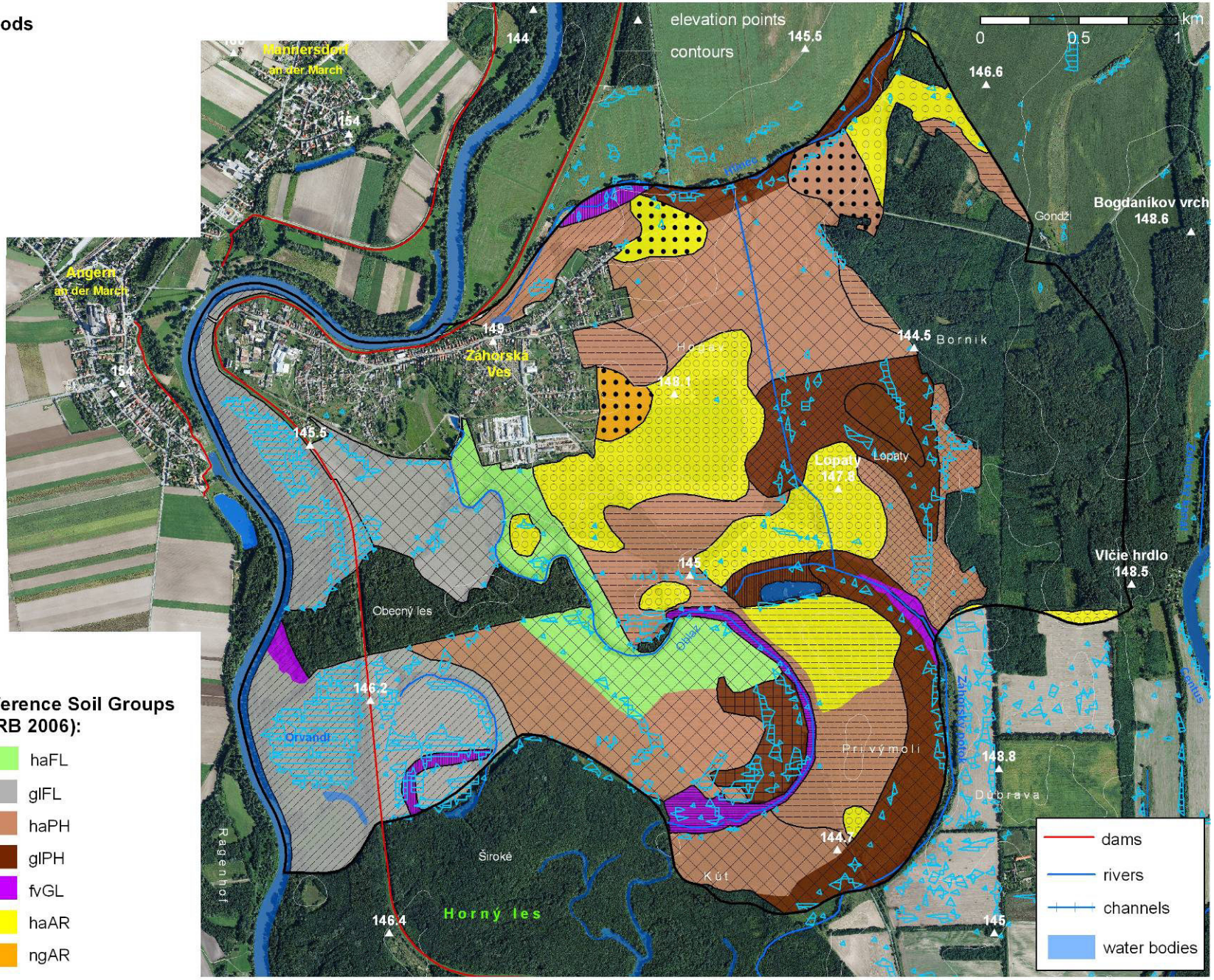
Soil texture and Floods

Záhorská Ves



floods

Záhorská Ves cadastre

Soil texture (Novák):

- P/P
- P(HP)/P
- HP/HP
- PH/PH
- PH/H
- H/PH
- H/H
- H/JH
- JH/H
- JH/JH
- JV/JV

Reference Soil Groups (WRB 2006):

- haFL
- glFL
- haPH
- glPH
- fvGL
- haAR
- ngAR

Conclusion 1

Selected areas around Angern and Záhorská Ves represent from the natural point of view two **different types of lowland country**:

- while on the Austrian side the relief from the river to the country gradually rising towards the lower or middle (?) river terraces (hence the occurrence of Chernozems),
- the Slovak side is typical country of floodplain which relief is divided horizontally, into the system depressions, dead branches, flat alluvial plains and elevation of the Pleistocene consisting of blowing sands.

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Conclusion 2

In Záhorská Ves we have applied other approach to flooding origin

- Flooding is caused not only by river water but also due to ground water level, which is in hydraulic connection with surface water levels.
- At the flooding, the ground water level increases, moreover in the case of rain, the rain water cannot be well drained in concave depression forms.
- Also the retention capacity of the soil is low. Urban area of the village itself is situated in a little higher position.

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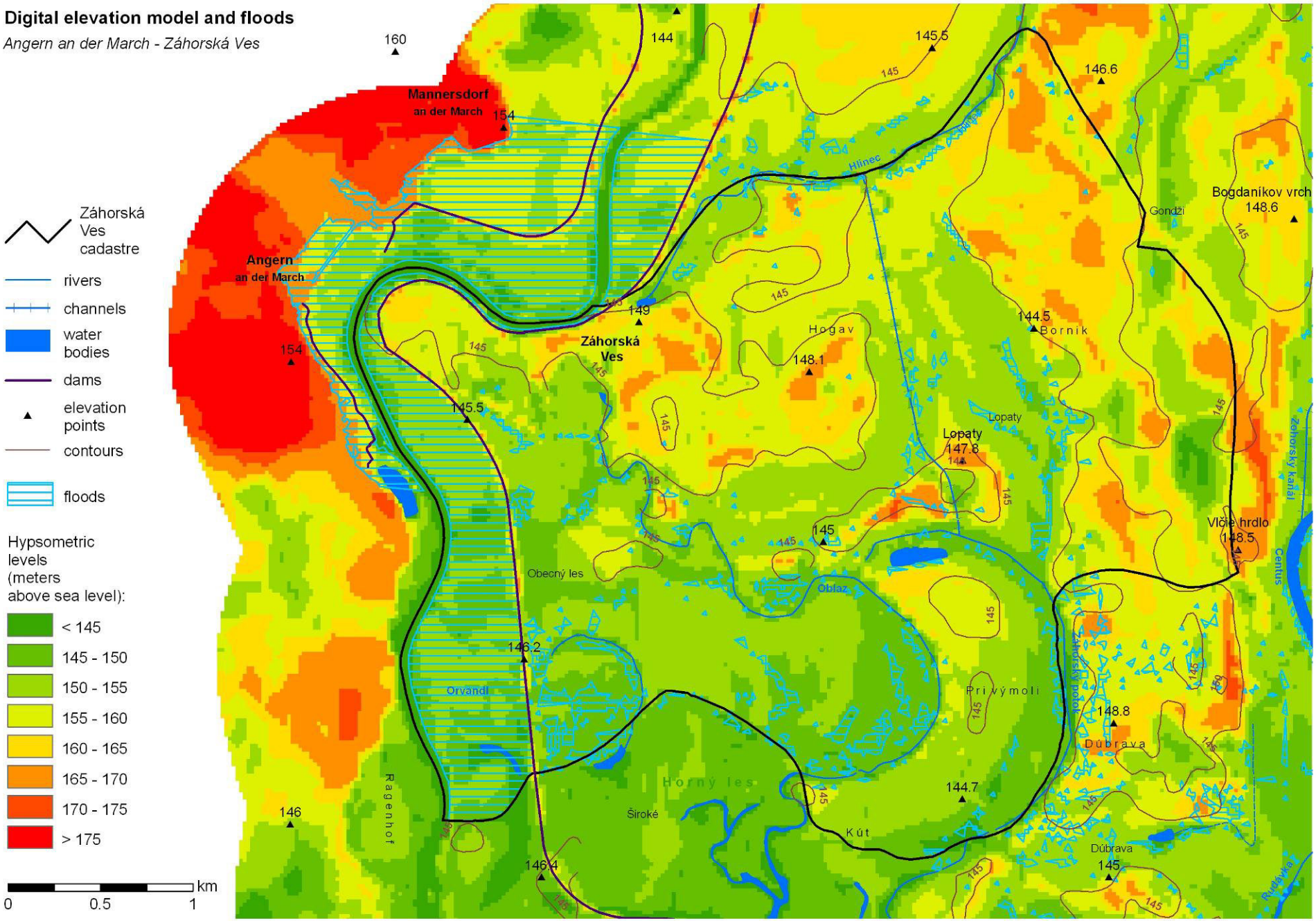
Digital elevation model and floods

Angern an der March - Záhorská Ves



Soil types (texture) identification

- **On depression landforms** (mostly flooded by river Morava) are: Gleysols, Gleyic Phaeozems, Gleyic Fluvisols.
- The flat relief of **the alluvial plains** (mostly flooded by rains and ground water level) are linked with Gleysols, and Phaeozems.
- On the **sandy dunes** elevations can be found Regosols, and Arenosols (without significant hydrological influence)
- The most flooded areas are consisting of soils with lower retention capacity and soil texture – loamy as well as clayey-loamy, and clays.

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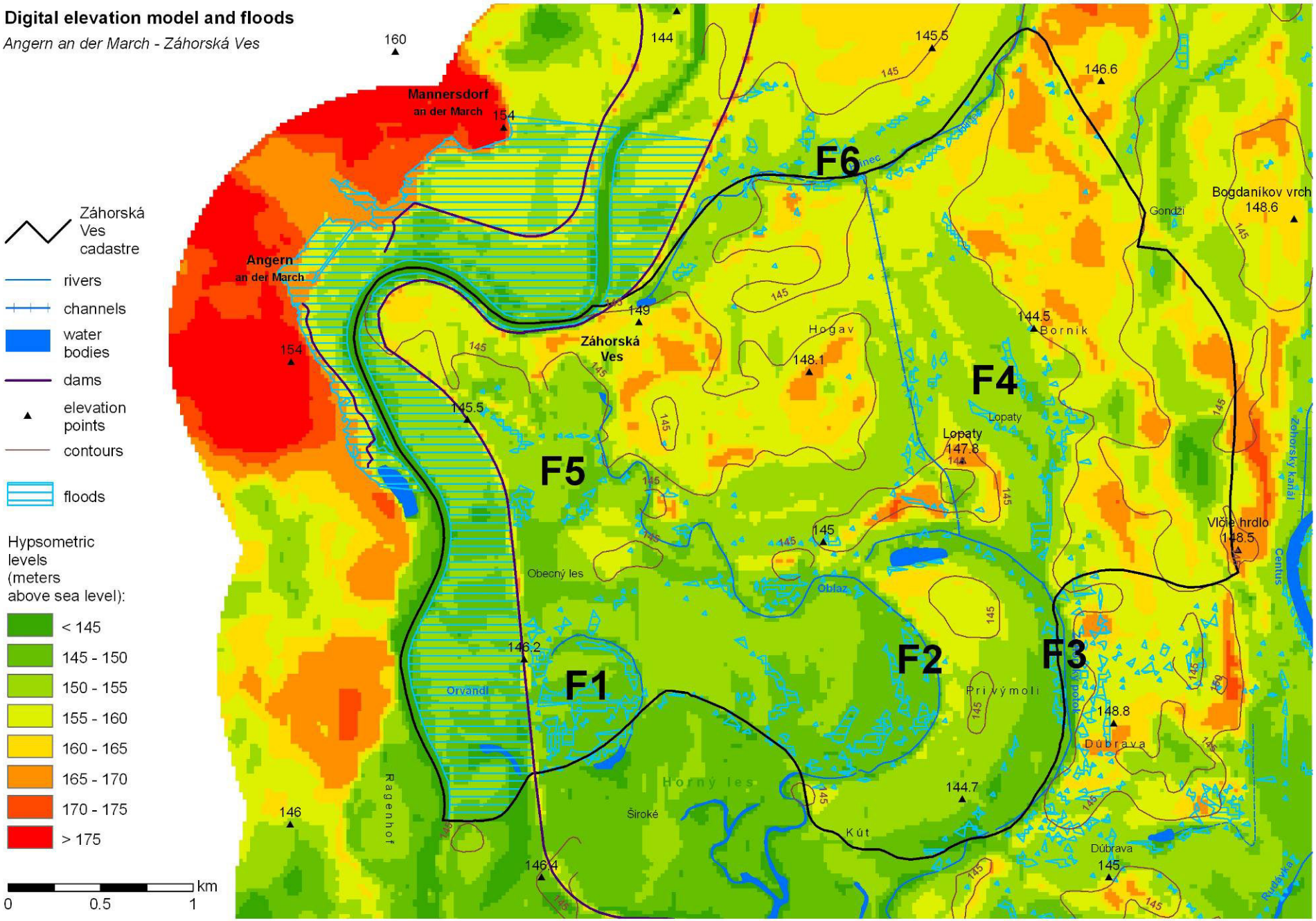

Flooding areas

- **F1** – depression of the dead branch with Gleysols and Fluvisols with shallow ground water level,
- **F2** – depression of the dead branch, or the watercourse Oblaz with Gleysols and Gleyic Phaeozems with shallow ground water level,
- **F3** – depression of the dead branch of the watercourse Záhorský potok with Gleysols and Gleyic Phaeozems with shallow ground water level
- **F4** – depression, concave relief form with shallow ground water level, with Gleyic Phaeozems,
- **F5** – depression, concave relief form with shallow ground water level with Gleyic Fluvisols,
- **F6** – the area along the watercourse Hlinec with Gleysols, Gleyic Phaeozems, the part of the water is derived by canal interconnecting the creek Hlinec with Záhorský potok.

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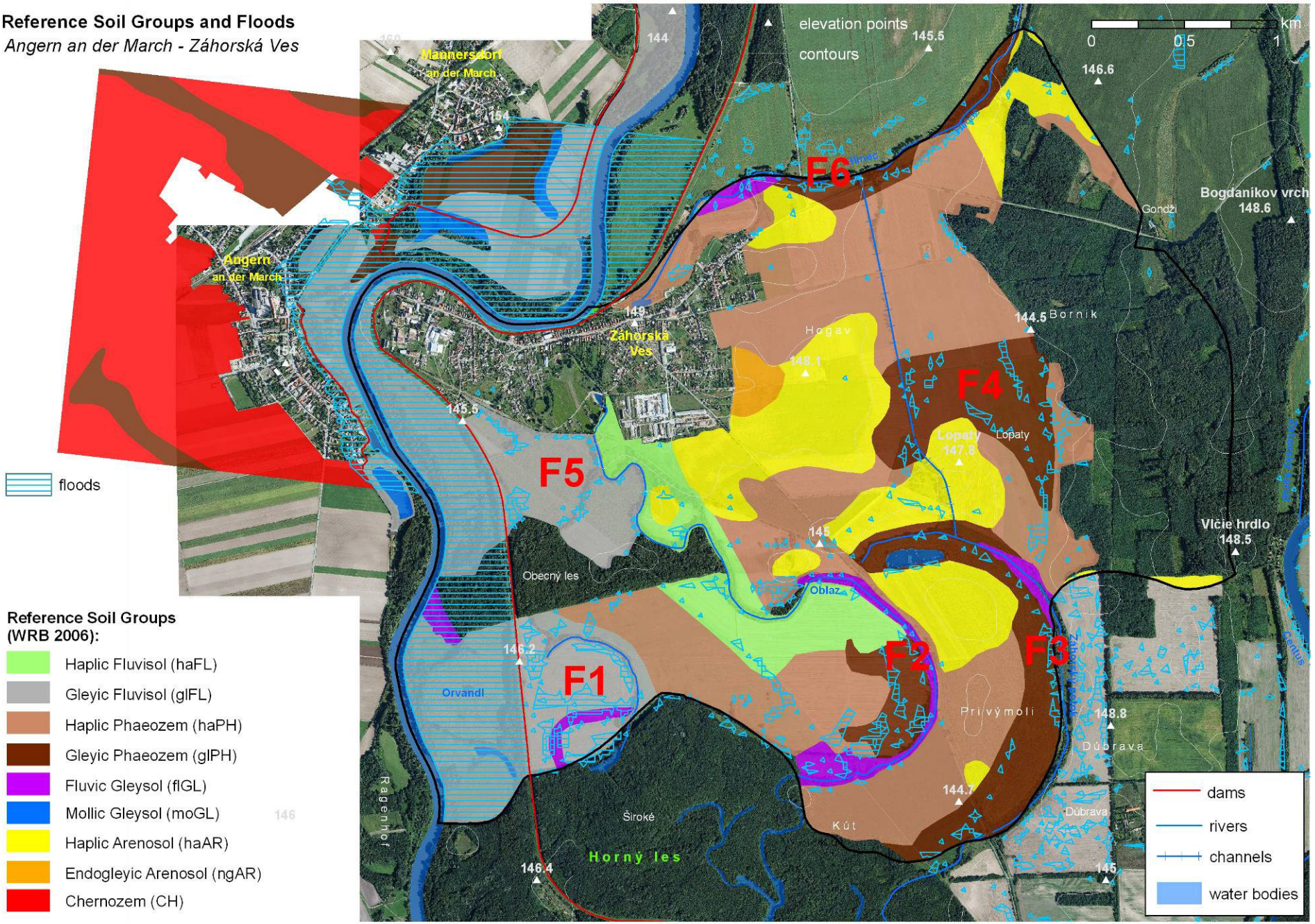
Reference Soil Groups and Floods

Angern an der March - Záhorská Ves



Reference Soil Groups (WRB 2006):

- Haplic Fluvisol (haFL)
- Gleyic Fluvisol (glFL)
- Haplic Phaeozem (haPH)
- Gleyic Phaeozem (glPH)
- Fluvic Gleysol (flGL)
- Mollic Gleysol (moGL)
- Haplic Arenosol (haAR)
- Endogleyic Arenosol (ngAR)
- Chernozem (CH)

Cross-border area Záhorská Ves – Angern an der March

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